The EDISON ELECTRIC INSTITUTE BULLETIN

June
1955

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Power Facilities Tested in Nevada Atomic Blast

Executive Development Program
Ernest R. Acker

Hydroelectric Power
W. C. Mullendore

Electric Utility Industry Research
Harold P. Seelye

So You Want to Mechanize Materials and Supplies

Job Briefing in the Field
R. F. Stone

Published Monthly by Edison Electric Institute

ELECTRICAL RESEARCH STATISTICS
THE ELECTRIC LIGHT AND POWER INDUSTRY

Current Statistical Data Covering 100 Per Cent of Industry

(Includes Investor-Owned Companies, Cooperatives, and Government-Owned Utilities)

March, 1954-1955

SOURCE AND DISPOSAL OF ENERGY—MONTH OF MARCH

	1955	1954	%
NET GENERATION* (Kwhrs in Thousands)			
By Fuel Burning Plants	34,050,693	28,997,663	+17.4
By Water Power Plants	10,398,734	9,920,793	+ 4.8
Total Generation	**44,449,427**	**38,918,456**	**+14.2**
Add—Net Imports Over International Boundaries	304,092	69,249	.....
Less—Company Use	130,604	124,223	+ 5.1
Less—Energy Used by Producer	1,185,253	670,831	+76.7
Net Energy for Distribution	**43,437,662**	**38,192,651**	**+13.7**
Lost and Unaccounted for	5,154,465	4,988,186	+ 3.3
Sales to Ultimate Customers	**38,283,197**	**33,204,465**	**+15.3**

CLASSIFICATION OF SALES

NUMBER OF CUSTOMERS—As of March 31			
Residential or Domestic	43,439,370	42,150,691	+ 3.1
Rural (Distinct Rural Rates)	1,605,014	1,621,465	− 1.0
Commercial or Industrial:			
Small Light and Power	5,962,178	5,873,666	+ 1.5
Large Light and Power	276,655	272,545	+ 1.5
Other Customers	167,088	160,272	+ 4.3
Total Ultimate Customers	**51,450,305**	**50,078,639**	**+ 2.7**
KILOWATTHOUR SALES—During Month of March			
Residential or Domestic	10,374,562	9,263,242	+12.0
Rural (Distinct Rural Rates)	719,257	663,371	+ 8.4
Commercial or Industrial:			
Small Light and Power	6,268,548	5,668,390	+10.6
Large Light and Power	19,253,294	16,008,448	+20.3
Street and Highway Lighting	370,518	341,627	+ 8.5
Other Public Authorities	830,406	767,652	+ 8.2
Railways and Railroads:			
Street and Interurban Railways	236,858	252,252	− 6.1
Electrified Railroads	178,785	191,931	− 6.9
Interdepartmental	50,969	47,552	+ 7.2
Total to Ultimate Customers	**38,283,197**	**33,204,465**	**+15.3**
Revenue from Ultimate Customers (Thousands)	**$651,058**	**$589,852**	**+10.4**

RESIDENTIAL OR DOMESTIC SERVICE

AVERAGE CUSTOMER DATA—For 12 months ended March 31, 1955			
Kilowatthours per Customer	2,606	2,400	+ 8.6
Average Annual Bill	$69.84	$65.28	+ 7.0
Revenue per Kilowatthour	2.68¢	2.72¢	− 1.5

* By Courtesy of the Federal Power Commission.

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The objectives of the Edison Electric Institute are:

The advancement in the public service of the art of producing, transmitting, and distributing electricity and the promotion of scientific research in such field.

The ascertainment and making available to the members and the public of factual information, data, and statistics relating to the electric industry.

To aid its operating company members to generate and sell electric energy at the lowest possible price commensurate with safe and adequate service, giving due regard to the interests of consumer, investor, and employee.

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The EDISON ELECTRIC INSTITUTE BULLETIN

June, 1955

Vol. 23 No. 6

Articles, Speeches, Reports

Electric Power Facilities Tested in Nevada Atomic Blast... 163

Justification for an Executive Development Program
Ernest R. Acker 167

Hydroelectric Power
W. C. Mullendore 171

Research in the Electric Utility Industry
Harold P. Seelye 174

So You Want to Mechanize Materials and Supplies..... 178

Job Briefing in the Field
R. F. Stone 182

Transmission and Distribution Committee Meeting
J. W. Anderson 184

Hydraulic Power Committee Meeting
P. M. Hess 185

Electrical Equipment Committee Meeting
C. L. Derrick 187

Purchasing and Stores Committee Meeting
J. Donald Hogg 188

News, Notes, Miscellany

Planned Lighting Aids 189

214 Communities Enter $10,000 Contest for Community Development in Pennsylvania 191

Charles A. Collier Farm Electrification Building Dedication 192

CONVENTIONS AND MEETINGS

1955

JUNE

20-23 ASME Semi-Annual Meeting, Statler Hotel, Boston, Mass.

20-24 American Society for Engineers Education Annual Meeting, Penn State University, State College, Pa.

22-24 Northwest Electric Light & Power Association Accounting and Business Practice Section, Vancouver Hotel, Vancouver, B. C.

26-28 Wisconsin Utilities Association Accounting Section, Dell View Hotel, Lake Delton, Wis.

26-29 Michigan Electric Association Annual Convention, Grand Hotel, Mackinac Island, Mich.

26-July 1 58th Annual Meeting, American Society for Testing Materials, Chalfonte-Haddon Hall, Atlantic City, N. J.

27-29 CEA Annual Convention, Hotel Vancouver, Vancouver, B. C.

27-30 University of Michigan 8th Annual Conference on Aging, Ann Arbor, Mich.

27-July 1 AIEE Summer General Meeting, New Ocean House, Swampscott, Mass.

30 PIP Mid-Atlantic Regional Meeting, N Y Athletic Club, Manhattan Room, New York, N. Y.

JULY

8 NARUC Executive Committee Meeting, LaSalle Hotel, Chicago, Ill.

11 EEI-AGA Accounting Executive Committee Subcommittee on Uniform System of Accounts, EEI Headquarters, New York, N. Y.

21 EEI Industrial Relations Committee, EEI Headquarters, New York, N. Y.

AUGUST

11-12 Southeastern Electric Exchange, Personnel Administration Section, Roanoke Hotel, Roanoke, Va.

15-19 AIEE Pacific General Meeting, Butte, Mont.

SEPTEMBER

11-14 Rocky Mountain Electrical League Annual Fall Convention, Grand Teton Lodge, Jackson Hole, Wyo.

12-16 IES National Technical Conference, Cleveland, Ohio.

13-14 EEI-AGA Accounting Division Organizational Meetings, Netherland Plaza Hotel, Cincinnati, Ohio.

15-18 Public Utilities Association of the Virginias 37th Annual Meeting, Greenbrier Hotel, White Sulphur Springs, W. Va.

19-21 EEI Industrial Relations Round Table Conference, Drake Hotel, Chicago, Ill.

21-23 National Industrial Conference Board Marketing Meeting, Waldorf-Astoria Hotel, New York, N. Y.

22-23 Southeastern Electric Exchange Engineering and Operation Section Meeting, Charlotte Hotel, Charlotte, N. C.

22-23 EEI Industrial Power and Heating Group, EEI Headquarters, New York, N. Y.

23 Oklahoma Utilities Association, Meeting of Gas Division, Oklahoma City, Okla.

1955

26 EEI Purchasing and Stores Committee, Planning, EEI Headquarters, New York, N. Y.

29-30 EEI Transmission and Distribution Committee, Jung Hotel, New Orleans, La.

OCTOBER

3- 7 AIEE Fall General Meeting, Morrison Hotel, Chicago, Ill.

3- 5 EEI Meter and Service Committee, Hotel Syracuse, Syracuse, N. Y.

3- 5 EEI Prime Movers Committee, Hotel Cleveland, Cleveland, Ohio.

5- 7 PIP Workshop Conference, Chase-Park Plaza Hotels, St. Louis, Mo.

14 Oklahoma Utilities Association, Meeting of Accounting Section, Lawton, Okla.

17-18 EEI Electrical Equipment Committee, Shoreham Hotel, Washington, D. C.

17-19 Joint Meeting AGA 37th Annual Convention and Pacific Coast Gas Association 62nd Annual Convention, Statler, Ambassador and Biltmore Hotels, Los Angeles, Calif.

20 National Industrial Conference Board Meeting of Board Members, Waldorf-Astoria Hotel, New York, N. Y.

20-21 Southeastern Electric Exchange Accounting Conference, Hotel San Carlos, Pensacola, Fla.

24-27 NARUC 67th Annual Convention, Grove Park Inn, Asheville, N. C.

26-28 National Industrial Conference Board Special Atomic Energy Conference, Waldorf-Astoria Hotel, New York, N. Y.

27-28 PEA Electrical Equipment Committee, Hotel New Yorker, New York, N. Y.

27-28 Southeastern Electric Exchange Sales Conference, Biltmore Hotel, Atlanta, Ga.

NOVEMBER

3-4 EEI-AGA Taxation Accounting Committee, Plaza Terrace Hotel, Cincinnati, Ohio.

9-10 Pacific Coast Electrical Association Hawaiian Section Conference, Honolulu.

13-18 ASME Diamond Jubilee, Congress, Hilton and Blackstone Hotels, Chicago, Ill.

14-16 EEI Accident Prevention Committee, Beaumont Hotel, Beaumont, Texas.

17-18 EEI Industrial Relations Committee, joint meeting with New England Personnel Group, Somerset Hotel, Boston, Mass.

17 National Industrial Conference Board General Meeting, The Bellevue-Stratford Hotel, Philadelphia, Pa.

21-23 Wisconsin Utilities Association, Electric and Gas Section, Schroeder Hotel, Milwaukee, Wis.

DECEMBER

15 EEI Industrial Relations Committee, EEI Headquarters, New York, N. Y.

15 National Industrial Conference Board Meeting of Members, Waldorf-Astoria Hotel, New York, N. Y.

Electric Power Facilities Tested in Nevada Atomic Blast

ALONG with many other components making up the pattern of American living, electric service equipment underwent an ordeal by atomic attack on May 5th, in the Federal Civil Defense Administration's widely publicized "Operation Cue" in the Nevada desert.

Within three hours after the blast at the Atomic Energy Commission's Nevada test site a team of Edison Electric Institute representatives went into the area to make an initial survey of the damage. One grim fact stood out in the preliminary evaluation—that while the damage caused to electric supply facilities closest to the shot (4,700 ft) could be quickly and easily repaired, two of four residential structures served were completely demolished.

In summing up, the EEI project personnel concluded that damage to the electrical system was largely confined to transmission and distribution circuits and was similar to what might be expected in a severe windstorm. Extreme initial heat from the explosion caused slight charring of some of the wooden poles.

An identical electric system of transmission towers, pole lines, substation equipment, and transformers 10,500 feet away from the blast came through completely intact. Dwellings at this location suffered severe damage to windows and doors, but were considered safe enough structurally for immediate occupancy.

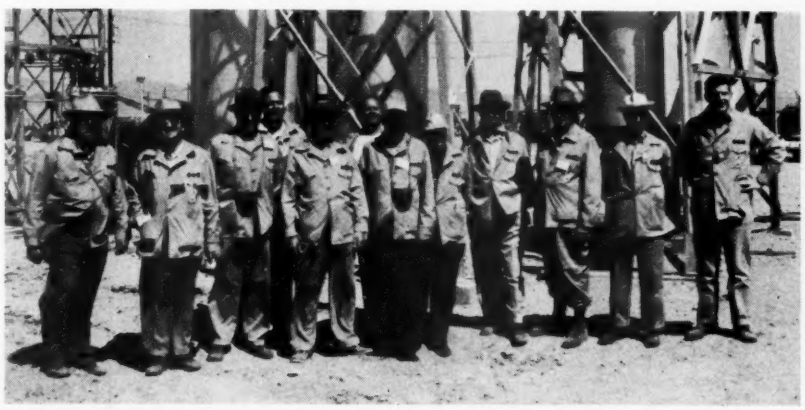
A detailed report covering the results of the test and outlining EEI participation in "Operation Cue" is now in preparation, to culminate more than a year of work. Prior to being distributed, the report must be cleared by the AEC and Federal Civil Defense Administration.

The initial steps were taken in April, 1954, when Paul B. Metcalf of The Narragansett Electric Co., Chairman of the Subcommittee on Continuity of Service Protection of the EEI Electric Survey Committee, and Dan Sullivan of Commonwealth Edison Co. met in Washington with FCDA personnel to consider the possibility of EEI taking part in the forthcoming Nevada atomic exercises.

This discussion was reported to the EEI Board of Directors, and Institute President Harold Quinton appointed a committee consisting of Mr. Metcalf, as chairman; E. L. Hough of Union Electric Co. of Missouri, Chairman of EEI Engineering Division General Committee; and James F. Davenport, Vice President, Southern California Edison Co., to develop recommendations on participation.

Ralph V. H. Wood of Philadelphia Electric Co. was appointed project officer, and A. C. Werden, Jr., of Southern California Edison Co., was appointed deputy project officer.

Further consultations with the

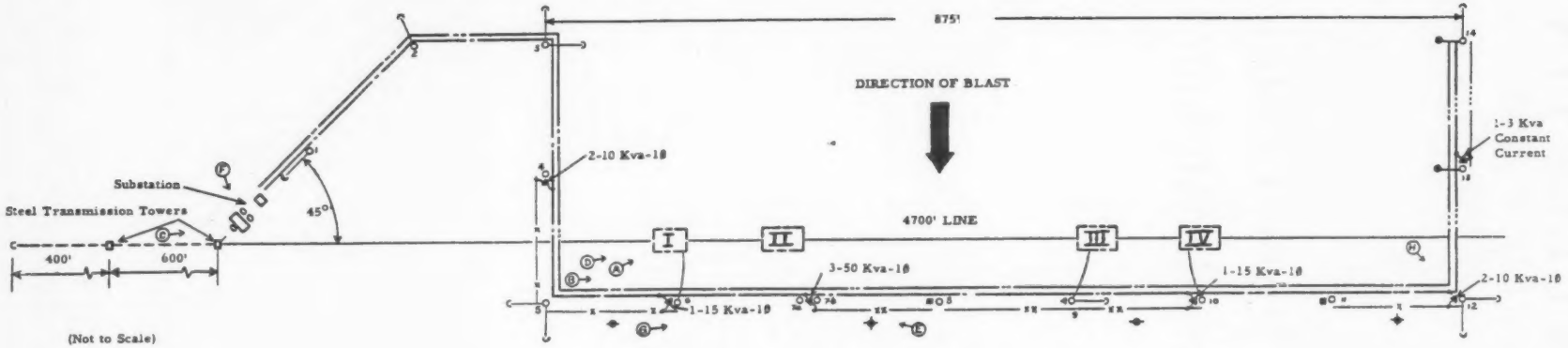


Members of the EEI contingent, pictured at the Nevada atomic test site, were (left to right) A. C. Werden, Jr., deputy project officer; Karl Bausch; W. G. Meese; R. L. Berg, assistant project officer; R. V. H. Wood, project officer; R. E. Hart; P. B. Metcalf; C. C. Whelchel; John R. Kiely; E. L. Hough; M. E. Paddleford; and M. M. Ulrich.

GROUND PLOT OF E.E.I. TEST INSTALLATIONS AT 1955 NEVADA ATOMIC TEST

LOCATED 4,700 FEET FROM GROUND ZERO

(Duplicate Installation at 10,500 Feet From Ground Zero)



LEGEND

- 69 KV-3ø #2/0 CU BARE
- 11 KV-3ø #2/0 ACSR 6x1
- 5 KV-AERIAL CABLE 3-CONDUCTOR #2/0 CU WITH 1/2" COPPERWELD MESSENGER
- 4 KV-3ø & N #4/0 CU BARE
- SECONDARY #4 CU BARE
- SECONDARY RACKS #2 AL WP
- 6.6A SERIES LTG #6 CU BARE
- STREET LTG BRACKET & FIXTURE
- POLES
- DISTRIBUTION TRANSFORMER
- POTHEAD
- GUY
- STEEL TRANSMISSION TOWER
- STREET LTG STANDARD-STEEL
- STREET LTG STANDARD-CONCRETE
- CAPACITORS
- LOCATION AND DIRECTION IN WHICH PICTURES WERE TAKEN
- TEST HOUSES BY OTHERS
  - I - 2-story brick house
  - II - 1-story frame house
  - III - 1-story masonry-block house
  - IV - 1-story pre-cast concrete house

Note: Location and direction in which pictures were taken are shown in diagram on opposite page.

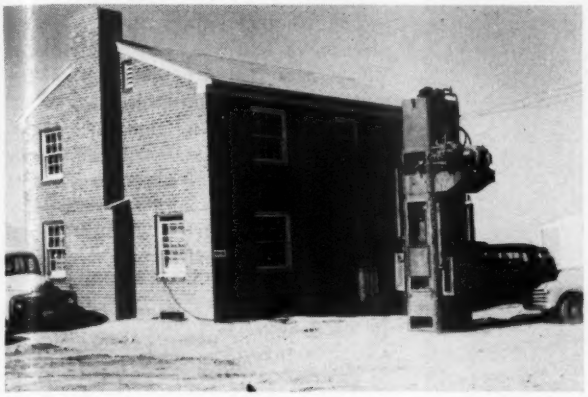


Fig. A—Pictured above is a two-story conventionally-built brick house at the Nevada test site prior to the atomic explosion. A power distribution line, not shown in this picture, runs behind these houses. The piece of machinery behind the house is in its test position, simulating a location behind factory walls.

Fig. B—This is the power distribution line erected behind the house shown in Fig. A. A typically constructed wood frame house can be seen in the left background. Note the steel street lighting standard to the right of the power distribution line.

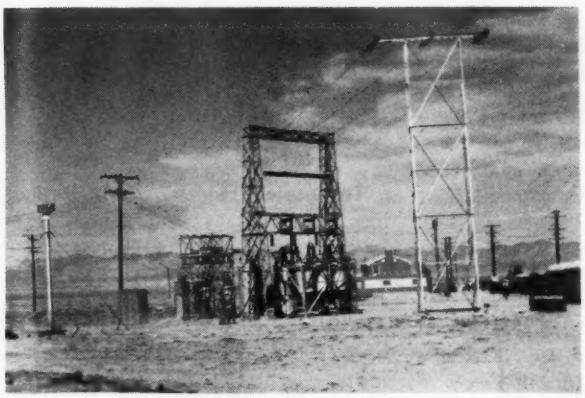


Fig. C—This is a view of the substation and a transmission tower prior to the blast. In the background can be seen the top of the two-story brick house shown in Fig. A above. The pole in left foreground houses a camera.

Fig. D—After the blast brick house pictured in Fig. A appeared as shown at the left. The demolished wood frame house is at the right.

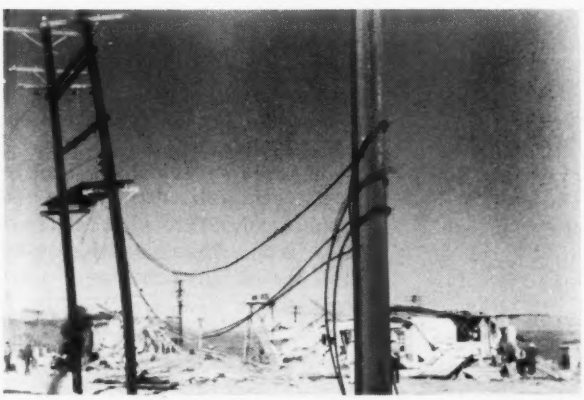


Fig. E—This picture shows secondaries that were snapped off at Pole 8 and wrapped around a steel street lighting standard. Demolished wood frame house is in right background, brick house is in left background. Poles 7a and 7b, showing empty platform after blast blew off three 50-kva transformers, are on the left.

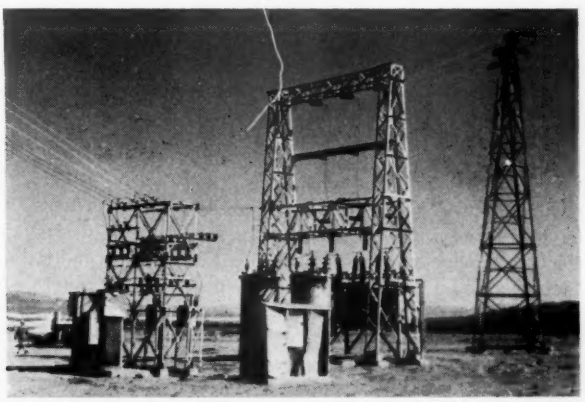


Fig. F—This picture shows the substation and a transmission tower after the blast. The damaged relay and meter cubicle appears in the foreground. Note dished panels on 4-kv regulator housing. These regulators were shifted on the foundation by the blast. This caused a break in some connections with the buses.

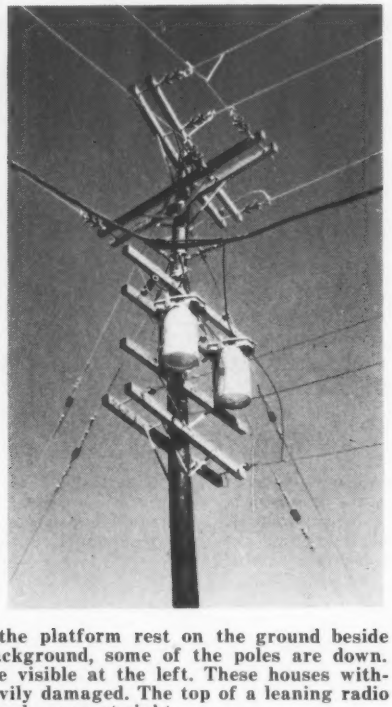


Fig. G (Left)—Transformers blown from the platform rest on the ground beside the distribution line after the blast. In background, some of the poles are down. Specially constructed, reinforced houses are visible at the left. These houses withstood the blast, but their interiors were heavily damaged. The top of a leaning radio transmission tower can be seen at right.

Fig. H (Right)—Shown above is a corner distribution pole after the blast. Note blackened crossarm which faced blast.

FCDA resulted in a plan which was reported to Mr. Wood by the Board in September and approved at that time.

Bechtel Corporation was retained by EEI as consulting engineers for design, construction, and evaluation phases of the test, with R. L. Berg of Bechtel being named as resident engineer and assistant project officer, and R. E. Hart, also of Bechtel, to assist.

As soon as they were appointed, the project officers went to work on arrangements. Primary objectives of the test were to determine the ability of electric supply systems to withstand the effects of an atomic explosion in comparison with the structures they serve; to ascertain the type of damage which an atomic bomb would cause; and to investigate the nature of the problem which would be presented in rapid restoration of electric service to areas where homes, factories, and other establishments would survive sufficiently to permit occupancy.

To carry out these objectives, construction of the two identical electric supply systems was started in December, 1954, and completed in February, 1955, two months before the shot was scheduled to take place. One system was built 4,700 feet from "ground zero," the point of explosion, while the other was at the 10,500-foot range in order to have the nearer installation subjected to moderately severe damage and the other to light damage. Each installation was placed in a common area designated by the Atomic Energy Commission where houses, radio towers, gas utility equipment, and other test items were located.

The electrical systems developed included representative components required for serving industrial, commercial, or urban residential load.

Each system included a 69-kv line installed on one steel suspension tower and one steel dead-end tower; substation equipment consisting of a 69-kv oil circuit breaker, step-down transformers, and associated structures; distribution substation equipment consisting of two 4-kv oil circuit breakers and voltage regulators; and about a half-mile of 11-kv and 4-kv distribution line construction on wood poles, with distribution transformers and secondaries.

It was not feasible to expose a large generating station to this test. Furthermore, with existing interconnections between electric companies, electric power could be transmitted to stricken areas from distant points if local generating facilities were destroyed or severely damaged.

The electric supply systems were prominent features of the completed Yucca Flat test-site, which was dramatically christened "Survival City" and "Doom Town" by the press. Dominating the flat desert landscape was the 500-foot tower, housing at its top the atomic device.

The EEI committee had appointed a group of five consultants to observe the test and evaluate the results: W. G. Meese, The Detroit Edison Co.; M. E. Paddleford, Commonwealth Edison Co.; John R. Kiely, Vice President, and Karl Bausch, Chief Electrical Engineer, Bechtel Corp.; and M. M. Ulrich, EEI staff. In March, the AEC announced April 26th as the date for the open shot, and some five days before, observers and consultants arrived for pre-shot briefings and security clearances. The project officers had already been at the site. Four official observers were to witness the test: EEI President Quinton; Messrs. Hough and Metcalf; and C. C. Whelchel of Pacific Gas and Electric Co.

The project officers, who had quarters at the base camp, Mercury, 30 miles from the shot area, completed final checks on the electrical systems, and found them to be completely operative. All was in readiness. Then on April 25th, the AEC announced that the test would be postponed until April 27th.

Hours before daybreak on April 27th, the observers and consultants, quartered in Las Vegas, nearly 100 miles from Yucca Flat, made the long trek to the open shot observer area, where hundreds of others were gathering. Once again adverse weather conditions forced postponement.

It was not until May 5—and the fourth midnight ride to the desert—that the explosion actually took place. The EEI project officers and consultants watched through special dark glasses from a slight rise which overlooked the firing area some seven miles away.

At 5:10 a. m. the entire sky seemed to blaze unbearably as the device was detonated. A flash of heat was felt almost instantaneously by the watchers, who then became so absorbed in watching the mushroom shaped cloud form that 40 seconds later, the shock

(Continued on page **177**)

Justification for an Executive Development Program

By Ernest R. Acker

President, Central Hudson Gas & Electric Corporation

Presented at the Utility Management Workshop of Columbia University Department of Industrial Engineering, May 19, 1955

MY assignment is to discuss the approach of an executive to the problem of executive development and, in particular, the kind of evidence he requires that the expenditures of time and money involved in the conduct of a formal training program will be justified by the results achieved. This is a challenging assignment because it deals largely with intangibles and with matters of individual judgment which cannot be measured by simple and generally accepted yardsticks.

For this reason I would like to have you consider what I have to say with two reservations in mind: first, that I do not consider myself an expert in the field, and second, that my whole management experience has been with a relatively small gas and electric utility whose executive development problems do not necessarily compare with those of any other management living or dead.

I am particularly aware of the fact that, while the principles of an executive development program may be the same irrespective of size, the important element of personal contact is so much more readily achieved in the smaller company that my approach may not appear practicable to those who represent the larger companies. In any event I welcome the opportunity to review the experience of my own company and the conclusions I have reached as to the justification for a management development program.

Definition of the Job

As a background for my discussion, let me outline briefly my concept of the job for which we are attempting to develop managers and executives and then my specifications of the man we hope to bring out of the hopper. An executive or manager has the responsibility to advise and assist in the determination of sound objectives, policies, and program which will merit and obtain the support of the investor, the customer, and the employee, and to design and carry out basic operational procedures to effectuate the purposes of his company as determined by its Board of Directors.

He is responsible for the application of those principles of coordination, cooperation, and control which will assure the execution of all company functions in accordance with the principles, policies, programs, and budgets approved by the Board of Directors; for prescribing and receiving periodic and special reports from officers and department heads to measure conformity with established procedures; for effecting remedial administrative action wherever and whenever necessary; and for submitting reports of operations and financial position to his superiors and to regulatory, investor, employee, or other groups, as required.

He is responsible for the development, maintenance, and motivation of a well-qualified employee group; for the promotion, through his leadership, inspiration, and direction, of sound principles, standards, and practices affecting the selection, development, utilization, compensation, working conditions, and welfare of all employees, to the end that their productivity, teamwork, loyalty, and morale may make a maximum contribution to the total effectiveness of the organization.

Now, what kind of a man is this modern executive or manager on whom we hope to depend for the management leadership of the future? In my own thinking he is essentially a coordinator, who respects persons, recognizes ability, and relies upon teamwork to achieve results. He has a broad knowledge of general business principles, but need have only a basic knowledge of the elements of his own particular business. He has an open and inquiring mind trained to analyze and quick to get at essential facts. He loves to play with ideas and readily discards the old in favor of the new. He asks questions, seeks the judgment and advice of others, and listens more than he talks.

He leads his associates to the joint solution of organization problems, but accepts the responsibility for final decisions when it is clearly his duty to do so. He inspires others to develop their talents, to excel individually, but to work for the best interest of the organization as a whole. He fixes responsibility, delegates authority, and gives full opportunity for the development and demonstration of individual initiative.

He presents his case clearly and logically and keeps his associates constantly informed of the objectives and the intent of his management. He inspires confidence by what he *does* rather than by what he *says* and sets the character of his organization by the strength of his own convictions and the manner in which he comports himself.

But above all these things he has a consummate knowledge of human relations. He is sympathetic and understanding, quick to praise and slow to criticize, and sincerely interested in the welfare of the members of his organization. He defends his people jealously, values their friendship highly, but is firm in the execution of his duty when the interests of the company are involved. He is quick to recognize merit and prompt in his consideration of its reward. He is patient, just and true. He inspires loyalty by the character of his management and builds the spirit and morale of his organization on the pleasure and satisfaction of joint accomplishment.

Need for Executive Development

Aside from the essential qualities of personal integrity and honesty, these are the qualifications which I believe will secure high productivity and performance in any industrial organization. The question is—how shall we assure ourselves that these qualifications are being built into the execu-

tives on whom we must depend for the future? Can we leave it to chance, to the hope that they will learn by example or to the old concept of sink or swim? Obviously not. The pace of industrial progress today dictates that we will need more competent managers, more quickly than at any time in the past and I submit that this can only be accomplished by well-conceived and intelligently administered executive development programs.

Upgrading Abilities

While the major job in this field is the provision of competent future replacements, we cannot disregard the great need for upgrading the abilities of those members of management who will remain at their present organizational levels. This group constitutes the great majority in management and is responsible for the bulk of the routine management of the business. Their jobs will increase in importance with the growth of the organization and, if they are to meet the demands of the job of tomorrow, it seems clear that they must be made a part of any development program looking to the securing of optimum present and future management performance.

I feel, too, that the problem of replacement is not met by merely providing back-up men for each important position, but that the whole future of the organization will depend rather on the *character of the training* given these men and their associates in lesser management positions. This, in my opinion, is our hope for the future, that we can lead all members of management to greater joint accomplishment through the adoption of sound and effective management development programs.

Recognizing the Need

If this is the objective, let me outline the procedure in the adoption of such a program. It seems obvious that management must first recognize the *need*. This may arise from widely differing factors in various organizations. One may be faced with early retirement of an important number of its top executives, another with the need of rapid expansion of its organization to meet the growth of its business, or others with the need for new or upgraded management personnel to deal with questions of modernization, automation, changing economics, etc.

Whatever the reason, the first requisite is a competent and impartial analysis of the particular needs of the organization involved. In this analysis the entire organization should have a part and the leadership should be such that the organization is convinced the management is sincere in its intent to improve the quality of its performance. It is particularly important that all levels of management participate in the analysis and in the drafting of any new program which may develop so that the entire group will be stimulated to do critical and constructive thinking rather than to build up defenses for existing methods and practices.

This was the approach adopted by the Central Hudson Gas & Electric Corp. in 1949 when it became apparent that the management techniques of the organization were inadequate to meet the problems of expansion, rising costs, and decreased productivity experienced in the postwar period. The company needed in particular to recruit and train new supervisory personnel more rapidly than at any time in the past and to train existing personnel in improved management techniques to deal with changing economic and employee relations problems.

Survey of Employee Attitudes

In these circumstances, we engaged the services of Rogers, Slade & Hill, management consultants, and with the help of Thomas H. Nelson and his associates conducted a survey of employee attitudes. The survey covered a broad sample of exempt and nonexempt personnel and was conducted by our consultants with complete assurance of anonymity to all employees interviewed. The fact that the management was willing to subject to this kind of critical review was an important element in the success of the ultimate program. The following high spot review of the consultants' report may be of interest:

1. There is too much complacency among supervisors. Too many individuals are satisfied with doing what they can under the circumstances; too few make any effort to change or improve the circumstances even when they are not satisfied with them. Security is too often the prime consideration and security means keeping out of trouble, "do what you're told," "keep your nose clean," "it's best to play safe; after all, you're not expected to make many suggestions." There seems to be very little premium on initiative, particularly in regard to personnel problems or human relations.

These attitudes, characteristic of too many supervisors down the line, seem to be due to:

a. Superiors giving help primarily on the mechanics of the work but not much on how to deal with people.
b. Superiors not enlisting supervisors' participation in solving work or personnel problems. Consequently supervisors too seldom enlist the advice of their subordinates.

2. Supervisors lack skills and techniques of effective human relations. Supervisors are well meaning; very few are really "tough" or hard to get along with. But many feel seriously handicapped by lack of knowledge and skill in human relations, especially when they deal with the younger employee.

The supervisors are puzzled; some are afraid of the union and the conditions created by it. They retreat in the face of any challenge or threat of challenge by the union.

Some admit that the best way to be liked is to see that men get considerable overtime, rather than do what is reasonably expected during regular hours.

Lacking confidence in themselves and their techniques of motivating high standards of performance, they play safe and put up with the situation instead of making a determined effort to change workers' attitudes and improve the situation. Consequently, they often fail to claim and secure what are really management's rights. They tend to dodge responsibilities; they avoid initiative; they permit slighting of the job, both in quantity and quality. On the other hand, they wish they knew how to deal with these problems. Many are asking for help.

3. Too many supervisors fail to develop group feeling and group responsibility.

4. Too few know how to "sell" ideas. Some don't even realize the value of sharing ideas about company plans and policies with employees. They fail to tell all they should, so communication is spotty.

5. Most supervisors need to improve their planning and assigning of work, their delegation of responsibility and authority, their ways of appraising results. These represent the managerial phases of their supervisory responsibilities.

What they know has been learned largely by trial and error; "experience" has been as effective in teaching poor methods as it has good ones. Human relations, motivation, and morale would be improved by better planning, delegation, and ways of checking on results.

These five needs contribute to low productivity, spotty quality, human relations problems, and high costs.

The situation can be changed, first, through better communications; second, through training in supervision; and third, through better direction from superiors and more consultative management.

Let's look briefly at the implications of this situation for the department heads.

Needs of Management Group

Needs of the management group, (particularly department heads and those who direct supervisors of foremen), include the following:

1. Supervisors need more help on communication. Policies, plans, and executive decisions are not always passed down the line; often the transmission is delayed; what is learned by supervisors too often comes first from the union representative, the "grapevine," or even from outside the company.

Communication is too strictly limited to divisional matters; persons don't know what is going on in the other divisions or why. Company loyalties are handicapped. Supervisors aren't told enough about how to interpret and apply company policies and decisions even when told what they are.

2. Supervisors need more help from superiors on how to deal with personnel and human relations problems. Supervisors feel that they get plenty of help on the "mechanics" of their jobs, but they too seldom look to their superiors for help on such matters as how to motivate productivity or to build morale and teamwork, how to "handle" the younger element, and how to develop responsibility, initiative, interest in the job.

3. Both supervisors and some members of the management group need a clearer understanding of the organization structure, duties, and responsibilities and relationships. This applies especially to "line and staff" relationships and where two or more organization units are involved in an operation.

4. The organization needs more practice of consultative management by members of the management group. Most superiors would profit from enlisting more participation of their supervisory subordinates in solving day-by-day problems. They need to call for more communication "up the line." Supervisors need to be asked to contribute their ideas and to be given "examples" of how they should enlist participation of their subordinates.

5. More systematic development of personnel for replacements and for new positions.

It may be asked, "How do the above needs compare to those common to other comparable businesses or industries?" In brief, the situation which Central Hudson faces is not worse or more difficult than the typical company. In many respects the situation is much better than the average.

The situation is really typical of the more progressive companies which have been intelligently and honestly concerned about people and good management. Experience indicates, however, that these are the very companies which are least satisfied with their supervisory and management effectiveness and are doing the most to bring them to increasingly higher levels.

With this kind of report what better evidence could be presented to an executive of the need for immediate action. The question became not whether we could afford to make the necessary effort and expenditure, but whether we could afford not to—and it was clearly evident that the corrective action lay first, not in employee education, but in management development.

In summary, it was found that the company needed, first, training in supervision techniques; second, clarification of relationships, duties, responsibilities and authority within the organization; and third, modernization of communication practice, using the term in its very broadest sense.

Supervisory Conference Program

Based on these findings and the recommendations of its educational advisory committee, the company initiated first, a supervisory conference program conducted by its management consultants in weekly sessions following dinner meetings of the management and supervisory groups. The sessions were held for groups of from 15 to 20 persons, the management and supervisory personnel meeting in entirely separate groups. In the first series of sessions, instruction was given in subjects dealing with the principles and tools of modern management. These subjects included Principles of Sound Organization, Coordination and Control, The Supervisor's Responsibilities, How to Plan and Assign Work, How to Delegate and Audit Performance, How to Communicate and Sell Ideas, and How to Build and Maintain Good Human Relations.

In the second phase of the program, several sessions were devoted to instruction and training in Principles of Consultative Management, Techniques of Conference Leadership, and How to Plan and Lead Problem-Solving Conferences. These meetings were conducted by consultants using the coach and drill procedure, under which all participants received training and practice in all phases of conference leadership.

In the third phase, each group elected a chairman and secretary, chose group leaders on a rotating basis, and conducted a series of problem-solving conferences on subjects of their own choosing taken from their daily work experience. In this phase of the program, the consultants acted as observers, critics, and advisers of the group and summarized the results at the end of each conference. Through this procedure the participants gained confidence and assurance and learned how to apply their newly acquired skills in dealing with attitudes and emotions and in reaching joint conclusions.

Benefits

Some of the specific benefits may be summarized as follows:

1. Supervisors have had the opportunity to meet together and to become better acquainted and better informed as to each others problems on an interdepartmental basis. As a result they have a broadened viewpoint and have an increased knowledge of all phases of the company's operations.

2. They have concrete evidence of the management's support and appreciation of their efforts, and have the opportunity, through group thinking and discussion, to contribute to the adoption of improved methods and procedures.

3. They have gained greater knowledge of the importance and value of improved communications, human relations, cooperation, and coordination.

4. They have gained greater appreciation of the responsibilities of the supervisor and have adopted the prin-

ciples of consultative management in their dealings with each other and in their working relationships with those they supervise.

5. Trained conference leaders are available to assist in placing before employees and the public informative or educational material relating to company or industry operations.

6. Above all, conference principles and procedures have been adopted on a departmental basis and the younger men are having the opportunity at an early age to sit with supervisors and managers of all levels and from all departments and to participate on an equal basis with them in the consideration of common problems.

Early in 1954 a report entitled "History and Development of the Supervisory Conference Program and Recommendations for Future Application" was given to each participant and each group met to study and analyze this progress report.

We were pleased to find that the participants felt that the conference procedure with its problem-solving theme had served an important function in providing training and practice in the use of the principles of consultative management and the techniques of conference leadership, but more importantly that they recognized that it was only a part of a broad and effective *Management Development Program.*

With this new concept, the groups scheduled meetings on group-approved or management-sponsored subjects.

Subjects Covered

The subjects covered in the meetings can be grouped in two general classifications. Under the first classification, the groups took advantage of the opportunity to gain information about specific subjects in which the majority were interested. The subjects included financing, rate making, budgetary control, plant additions and improvements, and organization planning. Presentations were made to the various groups by officers and department and division heads who are not included as group participants. In the second classification, subjects related to position descriptions were discussed, and various members of the groups outlined their duties and responsibilities with emphasis on the coordination and cooperation with other departments involved in effective performance.

Regardless of the character of the subject matter, all members obtained great satisfaction from the meetings and felt that they were free to choose informative subjects of greater general interest and more directly related to the individual group functions than in the case of specific problem-solving conferences. In addition to this favorable attitude, the participants felt that they had an excellent opportunity for self-improvement. In those groups where individuals described their own functions, the interest was so great that it was difficult to limit the discussion to the allotted time. This may seem insignificant, but it must be remembered that prior to this Conference Program it would have been impossible to maintain this kind of interest on the part of the listeners and also impossible to persuade some of the participants to take part in such presentations.

Solution of Problems

It is interesting to note, however, that the problem-solving feature has not been forgotten or abandoned. As various members have outlined their duties and pointed out difficulties encountered because of carelessness, inaccuracy or lack of understanding on the part of others, the meetings have developed into problem-solving sessions. When the importance and nature of the difficulties became known and understood by others and as individuals appreciated the importance of coordination and cooperation, they have been working together productively in the conferences and in daily operations in solving each other's problems.

Although no precise formula has yet been devised to measure the results of this form of development program, we are satisfied that the program is highly effective. The participants have been induced to accept and believe in the management principles and techniques presented; they have increased their knowledge of human relations. They have been motivated to apply their knowledge in their day-to-day operations. Their efforts have brought about greater cooperation and coordination within the organization which has resulted in greater efficiency and productivity. They have been provided with a forum for the airing of difficulties and the elimination of misunderstanding. They have available a medium for the widespread dissemination of information. They are learning to think in management terms, to see how the elements of the management problem are tied together, and they have before them the opportunity to broaden and develop themselves so they may occupy an important position in a well-informed and better equipped organization for the future.

Collateral Benefits

We find that the program is regenerative in that collateral benefits develop as the program progresses. The results are cumulative and progressive. Some of the collateral developments are:

1. Study and emphasis on communications.
2. Improved employee bulletin.
3. News digest for supervisors.
4. Improved introductory program for new employees.
5. Employee information and education program.
   a. Economics
   b. Rates
   c. Niagara Redevelopment
   d. St. Lawrence
   e. Security Benefits Program
   f. Annual Report
6. Speakers bureau.
7. Position Analyses—Each supervisory employee assisted in the preparation of his own position analysis.
8. Position Descriptions—From the position analyses, position descriptions were prepared and such descriptions were reviewed with and approved by the respective supervisory employee.
9. All of this will logically lead to Performance Appraisal — The basic material contained in the Position Descriptions will serve as a starting point for the completion of Performance Appraisals.
10. Salary Administration — With these items completed, the groundwork will be completed for the establishment of a sound Salary Administration Program.

We are deeply impressed with the experience which we have had to date. We have noted improved abilities and attitudes of many individual supervisors and are confident that we are making definite progress in the development of our future executive and supervisory personnel.

In conclusion, may I quote Lawrence A. Appley's clear and concise statement that "management achieves its objective (1) by increasing the

(*Continued on page* 181)

Hydroelectric Power

By W. C. Mullendore
Chairman of the Board, Southern California Edison Company

A Statement before the National Industrial Conference Board Round Table on Natural Resources, New York, N. Y., May 20, 1955

I WANT first of all to state some simple basic and fundamental facts and economic principles concerning electric energy in general and hydroelectric energy in particular. Familiar as these may be, misunderstandings and fallacies which cause many of our troubles in the electric utility industry arise out of controversies and confusion which could never occur if these simple facts were clearly understood.

In these days of high tension and easy money, there is an avid search for magic lamps which will provide abundance without work. Desire leads to gullibility and, unfortunately, there are peddlers of panaceas who prey upon the gullible. Perhaps this explains the mystery of how some Americans can be led to believe that there is a peculiar problem or some great issue involving electric power, the solution of which insures everlasting prosperity.

Supply and Cost Problems

Because of the obvious dependence of modern life upon an adequate supply of electricity, three fallacies tend constantly to recur: (1) there are increasing difficulties in obtaining a sufficient supply—real danger of scarcity; (2) the cost of electricity is a big factor in the cost of living and of industrial products; and (3) an increase in supply of electricity would proportionately increase the standard of living. The facts are:

1. There is not now and there has not been any serious difficulty in maintaining an adequate supply except in special situations of temporary interruption by strikes, wars, floods, and droughts. This has been true despite the extraordinary growth of demand. The potential supply of electricity is just as great as is the fuel supply, which, for all practical purposes, is unlimited. All kinds of fuel, including anthracite, soft coal, brown coal, or lignite, as well as oil and gas and oil shale, are sources of energy which can be converted into electric energy. The production and distribution systems also present no unusual problems.

2. The cost of electric energy in the average family budget is about 1 per cent. The average family's daily electric bill is 18 cents; their daily tax bill (concealed and otherwise) is $5.00. A 4 per cent cut in their tax bill would add as much to their disposable income as would cancellation of their entire electric bill.

In industry, electric energy continues to take over the work load at a phenomenal rate. For example, in the past 30 years in which the Federal Reserve Board Index of Manufacturing increased by more than 300 per cent, the man-hours employed in manufacturing increased by 50 per cent, but the kilowatthours per man-hour increased by some 450 per cent. Yet the cost of this electric energy is only about 6/10 of 1 per cent of the value of that product. In other words, if the average manufacturer received a free supply of electricity, he might be able to reduce the price on his finished product by 1 per cent. As for relative importance of the tax and electric bill in business, just figure it out as to your own!

3. While electricity makes a vital contribution to the standard of living, like other essentials such as food and water, an increase of the supply beyond the utilization capacity or need of the consumer would not increase the standard of living. In short, electric energy, versatile and useful as it is, is only one factor in an entire complex. It is not a universal medium of exchange like money, and an unlimited supply of cheap electricity would not give us the abundant life of our dreamers. Anyone laboring under that illusion should ask himself: Suppose that in addition to my present supply of electricity, I was offered free of charge all that I could use. What uses would I make of it and how much would it add to my standard of living?

Falling water is only one form of energy which can be converted into electric energy. While it is an important source of supply, it is not the most important. In 1954, it is estimated that of the total amount of electricity produced in the United States, about 77 per cent was produced from fuel, and 22 per cent plus, from water power. While hydroelectric capacity is expected to increase from 22,181,000 kw in 1953, to 28 million kw in 1957, and to a maximum of 50 million kw in 1975, its contribution to the production of electricity by the later date will probably not exceed 20 per cent of the total.

Comparison of Costs

Neither is it true that electricity from hydro plants is less costly than that from steam plants. The comparison of costs between hydro and steam is very tricky, and the only general answer to the question as to comparative cost is that "it all depends." How so? Isn't hydro produced by nature?

Hydroelectricity is no more produced by nature than is steam-generated power. In both cases the electric energy has to be "manufactured" by mechanical means, from potential energy.

In the great bulk of hydroelectric projects, man must provide the reservoir, the dam, the tunnels, and the penstocks with which to collect the water and control and direct its fall into the powerhouse. Hyroelectric energy must be generated, and the power plant requires the turbine and the generator and all the other facilities required in a steam plant. Due to the heavy costs of structures to control the water, capital costs of the average hydro project are on the order of twice those of a steam plant.

In a speech at the American Power Conference on March 31, 1955, Alexander M. Beebee, President of the Rochester Gas and Electric Corp., had this to say about hydroelectric costs:

"The added cost of hydro generation facilities over the $150 per kilowatt of installed capacity which a steam plant requires must primarily be supported by the 3 mill fuel cost that hydro avoids. Roughly, in most cases this 3 mill saving in hydro operating cost will justify an added cost for hydro of $150 to $250 per kilowatt, depending on the method of financing. Therefore, when a hydro plant costs in excess of these figures plus the $150 needed for a steam plant, or a total of $300 to $400 a kilowatt, a steam plant is generally cheaper. The above figures will, of course, vary up or down in locations where abnormally high or low fuel costs are involved. These very same fundamentals exist in the case of atomic power which, like hydro, tends to be a source of energy with a fuel cost less than coal but requiring larger investments.

"Hydro power is also subject to the vagaries of weather, and is often located far from the market for power, which means expensive transmission costs as well as involving the hazards that affect reliability of service."

The experience we are having this year in curtailment of power supply from the Hoover Dam project on the Colorado River emphasizes the vulnerability of hydro to drought conditions. Lake Mead, back of Hoover Dam, has the greatest storage capacity of any power reservoir—30,000,000 acre-feet. Yet, due to a series of three dry years, that reservoir has been drawn down to only a little more than one-third of its capacity, and the allotment of power for the next year has had to be reduced to 70 per cent of the normal firm output.

In other areas, droughts have also seriously curtailed the supply in the past, as they will in the future. In the Tennessee Valley and in the Pacific Northwest, both areas where droughts are not so frequent as in the Southwest, serious shortages of hydro power have been suffered. This, of course, means that steam plants must be provided to stand by the hydro, and that in figuring the costs of power from hydro projects the cost of steam stand-by must be included.

Neither is hydro free from other costs. Dams, tunnels, penstocks, and reservoirs require inspection, and maintenance expenditures upon them are often very high. As Mr. Beebee indicates, high-voltage transmission lines, usually of great length and multiple in number, following different routes and requiring costly rights of way, also add to hydro costs.

Competition of Other Water Uses

Both the firmness of supply and permanence of hydro are adversely affected by the increasing competition of other water uses with hydroelectric generation. The incompatibility of flood control with hydroelectric development is obvious. An empty reservoir is insurance against floods, but it cannot help produce kilowatts. More important, the growth of population and industry and irrigation, with their increased consumption of water, is cutting into the regulated flow and storage of water for power production.

Irrigation has long been practiced in the arid West; not only is the consumption of water for this purpose increasing in that area, but the practice of irrigation is spreading to the Middle West and South. Industrial and municipal demands upon the water supply are rapidly expanding in all sections of our nation. These factors have been a long time in developing, but they will continue to increase in importance. Since they will dictate the release of stored waters, the permanence of hydroelectric production will unquestionably diminish.

Silting-up of reservoirs further erodes the productive capacity of hydro installations, and, as if additional complications were needed, the demand for more and more land area will continue to increase, and with it, the economic costs of flooding power reservoir sites will increase.

The Question of Saving Fuel

The argument most frequently used and emphasized in favor of the use of water power against steam power as a source of energy is that our supply of fuel is limited, and that we should develop hydro, even at a higher cost, because it will help us to save fuel. Two questions are thus raised: Are we in danger of exhausting our fuel supply? And, does hydro development actually save the depletion of our natural resources?

First, as to the fuel supply. As we have said, electric energy can be derived from all fuel, including the cheapest and most abundant, coal in all of its forms. From time to time, more or less alarming estimates are made as to the dwindling reserves of the natural fuels, and then just as frequently, we hear other estimates that, for all practical purposes, the coal supply, at least, is unlimited. Just now we are in a period in which the demand for coal has been greatly reduced, and mines which have great reserves have closed down, particularly because of the substitution of diesel for coal-burning locomotives on the railroads. Technological advances in the electric industry have dropped the consumption of coal from 10 lb per kwhr in 1882, to 2.4 in 1923, to .6 of a pound in some of today's modern plants.

When all the known facts are considered, it would appear that the supply of natural fuel which can be used for steam generation is sufficient to meet the demand for the next several hundred years. Viewed in its proper perspective, the problem of exhaustion of our fuel supply would seem to be much less serious than the problem of the exhaustion of iron ore and copper ore and other natural resources. Furthermore, the possibilities of the utilization of solar energy and atomic energy, and possibly other sources of energy, which are now under scientific investigation, would seem to assure that we need not be greatly concerned about the potential energy resources of the United States, or indeed of the world.

Incidental Benefits

Another argument which has great public appeal is that hydroelectric development results in incidental benefits, such as irrigation, flood control, conservation of wild life, recreational areas, and the like; and the suggestion here is that only government hydro projects satisfactorily provide these incidental benefits. This also involves the question as to whether government development provides both the power and other benefits at a lesser cost.

Upon these questions, I can cite from first-hand knowledge a typical and important hydro development, that of the Big Creek-San Joaquin River Project of the Southern California Edison Co. This is a multi-purpose project providing all of the incidental benefits, including storage of irrigation water, flood control, recreation, conservation of fish and wild life, as well as hydroelectric power.

Construction of this hydroelectric

project, which is one of the world's greatest, was begun some 44 years ago in 1911. The first units were put in operation in November, 1913. It is located in the Sierra Nevada mountains approximately 60 miles east of Fresno, Calif. It presently includes six powerhouses with a total effective operating capacity of 530,000 kw and five large storage reservoirs having an aggregate gross capacity of approximately 450,000 acre-feet of water.

The total original cost of the project, including the related high-voltage transmission lines to Los Angeles, is approximately $154,000,000, all of which is, of course, borne by power. That is, there are no credits to the power cost from irrigation, navigation, flood control, recreation, fish and wild life, etc.

All of the capital funds required were provided by private investors. All of the incidental benefits afforded are free of cost to the people directly receiving the benefits. The project also has yielded many millions of dollars of tax revenues to the public. The tax revenues which have been received by cities, counties, school and other public districts and the State of California alone aggregated at the end of 1954 approximately $36,000,000 or 23 per cent of the cost of this project development. The payments made to the Federal treasury for the use of public lands and for income and other taxes fairly allocable to this project would total many additional tens of millions of dollars.

It should be apparent that government development of our hydroelectric resources does not have advantages superior to those of private development. On the contrary, the interests of all the public, including those of the taxpayer, are better served by development under the American plan of voluntary investment of the savings of the people.

There is no magic by which government can avoid any of the real costs of power development. All that the government can do is to socialize some of those costs, through tax exemption and avoidance of interest charges by use of the public credit. Today, when the generation of taxes is an even more important function of business than is the generation of power, a power project which does not generate taxes but instead adds to them is a distinctly inferior public servant. It ill behooves the representatives of government, therefore, to don the cloak of superior virtue with respect to a government power development which is avoiding the most important single cost and passing this tax burden on to the public at large.

The government power protagonist is inclined to place the label of "giveaway" upon any project which is turned over to a tax-paying business enterprise. In fact, the label "giveaway" would be much more accurately attached to a government project wherein the public treasury loses taxes, incurs additional debt burdens, and is charged with the cost of providing flood control, irrigation, recreation and conservation of wild life, and similar benefits. Thus, the power from these multi-purpose government projects, as contrasted with a privately financed project, is relieved of a large share of the capital and other costs, and another unfair discrimination is made against the taxpayer and the tax-paying projects.

Summary

Neither the adequacy of the supply, nor the cost of electricity, presents a problem to the American consumer. Thanks to the initiative and enterprise of the electrical industry, and the support of the American investor, the generating capacity and the sales of electricity have doubled in the past ten years, and estimates indicate that another doubling will occur in the next decade.

Despite the great increase in use, the cost of electricity to the consumer has substantially declined since the war, in contrast to most other costs.

Water power as a source of electric energy is of lesser importance than fuel, and it is not necessarily a more economical source. In 1953, 75 per cent of the nation's supply was generated by steam plants and 23 per cent by hydroelectric units. Our hydroelectric resoures should be further developed as and when there is economic justification therefor. However, there is no foreseeable scarcity of basic fuel supply, and the development of higher-cost hydro in preference to steam power cannot be justified as being necessary to save a dwindling fuel supply. Neither is it true that hydro development does not require the utilization of even more important metal resources and other basic capital.

Citizens in government cannot develop power at less cost than can the private citizen. Government can conceal costs and distribute them arbitrarily to make lower charges possible to the electric customer at the expense of the taxpayer, but the real costs to the public as a whole of government development and production of power are greater than those of tax-paying industry.

Finally, our greatest problems of conservation and development today are not in the field of natural resources but of human resources. Its is not the supply of inanimate energy, but the misdirection and misapplication of human energy which is causing concern.

Those moral and spiritual qualities which can be developed by the individual human being only in an atmosphere of ordered freedom are being neglected while we pursue the "more abundant" life through joining collective pressure groups and inviting more and more government intervention in our affairs. It is self-reliance and the individual rights of our fellow men which are being sadly neglected. And while we are considering our relations to the physical universe, and the conservation and development of our physical resources and technology, should we not call a conference about our human resources and human relations?

E. F. Hauser

E. F. HAUSER, former Secretary of the Indiana Electric Association, died on May 17 at his home in Los Angeles, Calif.

Mr. Hauser was district manager for the Pennsylvania and Ohio Electric Co., Youngstown, Ohio, before moving to Indiana in 1937 to become general manager of the Indiana Statewide Rural Electric Cooperative, Inc. He resigned that position early in 1944 to become secretary of the Indiana Electric Association.

He filled that position until December, 1951, when his health forced him to take a leave of absence.

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Research in the Electric Utility Industry

By Harold P. Seelye

Manager of Engineering, The Detroit Edison Company

An Address before the American Power Conference, Chicago, Ill., March 30, 1955

IN any large modern industry, research is the key to progress. Successful competition within and between industries and also the urge toward a higher general standard of living for the country necessitates continuous investigation of new and better materials, designs, and methods. Furthermore, the public has in recent years been popularly educated in the value and romance of research. Research has come to be considered as a sign of a forward looking industry. This reacts on the acceptance of the industry's products and the reception accorded its securities. It should not be necessary to point to the many examples of this fact. They are all around us and in every day evidence.

The electric power industry offers no exception to these statements. This industry has had a remarkable history of development in which research has played a major part. This progress is continuing today and a future of even greater accomplishment may be confidently expected. During the past year or two there has been certain criticism directed at the industry in several published papers for what is claimed to be a lack of awareness of the need for research and of sufficient emphasis on it. Certainly, if this criticism is sound, it should be carefully considered and heeded, since the industry cannot afford to fall behind in this respect. It is the purpose of this paper to review the situation realistically, to bring out what has been and is being done, and to examine the needs and possibilities for further activity in research.

Research, as it will be considered here, includes rather broadly any organized investigation of new and untried materials, equipment or methods, in engineering and also in other fields. It excludes any mere testing or trials of devices or operations already developed. Research by manufacturers, colleges, independent laboratories, and government agencies must be included as well as that done or fostered by the power companies themselves. Included also should be the very great amount of work of this character which has been and is being done by committees of EEI, AEIC, professional societies, and other organizations, not only in specific investigations and developments but also in the assistance and encouragement rendered to others. They have provided means for assembling data on operating experience and industry requirements, exchange of information, and stimulation of the use and continued improvement of the fruits of research.

Past Accomplishments

The question of whether or not the electric power industry has, in the past, devoted enough attention and money to research is one which cannot have a positive answer. It must be largely a matter of personal opinion based on the results which have been accomplished. No compiled figures are available as to the amount of research dollars which have been and are being spent, and such figures would be of comparatively little significance if they were available. Dollars spent in this field are in no way a measure of the useful results produced. Similarly, future research programs should be based on the necessity and advantage of the probable accomplishments, not on some number of millions of dollars or some percentage of gross income.

The achievements in growth and technical excellence of the industry would seem to be sufficient evidence for the claim that research efforts to date have been quite adequate. Load growth has been rapid and appears likely to continue so. In general, load has doubled every ten years for the past three decades. This is evidence not only of sales effort but of the availability of a continuously increasing amount of satisfactory utilization equipment for the home and for industry. The development of improved lighting, electric heating, air conditioning, electric cooking, washing, and all the other modern convenience devices did not just happen. It has been preceded and accompanied by careful research in materials, in equipment, and in their proper application. In industry, the use of 16,000 kwhr of electric energy per year per worker, and the continuous increase of electric power application in all phases—for example, automatic machinery in manufacture, electric welding, electric steel melting, chemical processes, and many others—has been built upon a broad foundation of research. It is believed that developments in utilization of electric power have proceeded about as fast as they could have been absorbed by the public.

This rapidly growing load has been well served. In general, power has been available wherever and whenever it was wanted by the users and in ample amount for their needs. There have been relatively few cases of load curtailment, even under the abnormal stresses of war times. The service rendered has been good as to quality—continuity and voltage regulation—and the price has been fair, with a general trend downward over the years. This has been brought about by remarkable engineering developments in power systems and in equipment, which have kept pace with the requirements of the larger and larger loads and load concentrations. No enumeration of these advances is feasible, but a few illustrations may be mentioned.

(a) In power generation:

The present operation of generating units as large as 150,000 kw with sizes up to 300,000 kw being built.

Steam pressures of 2400 psi, with plants now projected using supercritical pressures up to 5000 lb.

Steam temperatures ranging up to 1200 F.

Hydrogen cooling of generators and inner winding cooling.

Economy in generation down to ¾ lb of coal per kwhr, or less.

(b) In transmission:

The introduction of voltages as high as 345,000 v in this country and 400,000 v abroad.

Circuit breakers of 25,000,000 kva interrupting capacity.

Developments in relaying, lightning protection, automatic control of frequency and voltage.

Interconnected operation of large systems.

(c) In distribution:

The great improvement in materials of construction and equipment, giving greater reliability and less maintenance.

Higher distribution voltages.

Great improvements in insulating materials for wires, cables, and other equipment.

No one can question the leading part which research has played in these developments — research in metallurgy, in insulating materials, in combustion, in equipment design, in system design. It seems obvious that there has been no lack of forward thinking and of creative action, and that the research necessary to carry out these accomplishments has been done. Could there have been more of it? Could progress and growth have been more rapid? Who can say? At least the electric power industry can take great satisfaction in its past performance.

The Utilities Share

It seems somewhat beside the point to ask if the utilities, the manufacturers, and other agencies have each taken or are taking their proper share in this program of progress. Developments by the manufacturer must be tried out and accepted by the utilities if they are to be useful. Conversely, ideas developed within the utilities must, in many cases, be translated into practical equipment by the manufacturers. There has been excellent teamwork throughout, of which many instances could be cited. The over-all result which has been and is being accomplished is the matter of real importance, not who has done what.

The utilities have, however, made very appreciable direct expenditures for research. Although few of the operating companies have their own research laboratories, many of them are sponsoring research projects by colleges and by research institutes and are contributing individually to other projects sponsored by such organizations as ASTM, Joint Research Council, and other national bodies. Furthermore, there is a great deal of work of a research nature going on in all utilities which is not so named but is classed as investigation or study. The utilities have jointly sponsored an increasing amount of research through the EEI and the AEIC. In addition to financial support of well defined projects, a very considerable part of the work of many of their committees is devoted to investigations, survey of industry needs, opinions and experience as a guide to improved practices and development of equipment, and to actual participation, many times jointly with the manufacturers, in such developments. Similarly, committees of the various professional societies such as AIEE, ASME, ASTM, and others are engaged in similar activities. By their representation on these multitudinous committees, the electric utilities are contributing very substantially to these research activities.

As specific examples of the magnitude of some of these research programs:

(a) There are several groups of companies actively engaged in the study of the possibilities of atomic power. The group of 33 companies, of which The Detroit Edison Co. is a member, was set up for the purpose of developing a practical, economical, nuclear power plant. It spent $1,940,000 in 1954 and has a budget of $3,800,000 for 1955. This group includes 25 utilities, four manufacturers, and four other organizations.

(b) Two of the larger utilities have estimated that their yearly expenditure for research, as herein defined, including specific projects, contributions, and related studies, is of the order of 1/3 of one per cent of their gross revenue. It is difficult, of course, to arrive at exact figures for any one company or for the industry, but the total amount of dollars now being allocated to research is certainly very substantial.

Typical of individual projects are these of The Detroit Edison Co.:

—basic studies on insulating oils.
—effect of fly ash on strength of concrete.
—dynamic behavior of high smoke stacks.

(c) The electric utilities, through the EEI and the AEIC, are now engaged in eight research projects, either by direct sponsorship or by contributions to other organizations. The total estimated cost of these eight projects is $840,000 of which EEI and AEIC are furnishing $341,000. These include a diversity of subjects such as:

—effect of high temperature on metals.
—strength of wood poles.
—application of calculating machines to utility accounting practices.

Future Program

Past accomplishment should not be viewed with too much complacency as a measure of future action. The real questions which must be faced are:

1. What are the problems which need attention, if the industry is to maintain its place as a progressive one?

2. What should the utilities do in attacking these problems?

3. How can the utilities program be best accomplished?

It is quite obvious that the growth of power loads and the power systems to serve them will, in the future, as it has in the past, bring many problems which will quite naturally be solved according to the pattern which has prevailed—partly by the manufacturers, partly by the utilities, and a great deal by cooperative effort. No attempt can be made to enumerate all of the worthwhile projects. A number were suggested recently in papers by Hobson, Lewis and Oldacre, and by Gaty at the AIEE Conference in February, 1955. In general, continued progress by the electric power industry will require considerable attention to research in all areas—generation, transmission, distribution, and utilization. Some of this will be necessitated by the ever increasing size of loads to be carried; some should be directed toward continued improvement in efficiency and economy. To mention specifically a few of the interesting possibilities—

(a) *Generation:* Advances into the

field of supercritical steam pressures and higher temperatures have already been projected. There is a great deal to be done in investigations of the behavior of materials under these conditions.

The substitution of atomic fuel for fossil fuels is being given a great deal of attention and much more is necessary.

There is still a vast quantity of coal to be burned, and its conservation is highly desirable. Economical methods of removing moisture from coal before shipment and of removing sulphur before burning would pay good dividends. An economical process of gasifying coal at the mine and transmitting the fuel as gas has great possibilities in simplifying fuel and ash handling problems, reducing air pollution, and stimulating the use of gas-fired prime movers.

A practical method of more direct conversion of heat energy into electrical energy than the present steam cycle, whereby 65 to 70 per cent of the energy in the fuel goes up the stack or down the river, would seem to be within the realm of possibility and very worthwhile.

(b) *Transmission and Distribution:* If loads are to continue to increase, what will the systems be like to carry them? Transmission voltages up to 400,000 v have been used and some study given to still higher values. Does the future lie in higher and higher voltages, or will a distribution of generating sources be necessary? There are still problems to be solved for voltages up to 400,000. Practical underground cables are certain to be needed for any system voltage adopted.

A better understanding of system transmission losses is needed, both for more economical allocation of generating sources and for improving over-all economy. About 15 per cent of energy generated is lost in transmission and distribution. Is this an economical situation? Could some other form of system, or other types of materials and equipment reduce this?

Overhead lines are, at present, an economic necessity. Can their appearance be greatly improved? Is it possible to devise a practical competitive underground distribution?

Even though service quality is good, the increasing importance of electric service to the customer and the greater sensitivity of automatic equipment make reduction in interruptions, and voltage dips, and closer voltage regulation of greater importance. What can be done to improve this service economically?

(c) *Utilization:* There are many possible additions to work saving devices. There is need for improved efficiency and economy in electric house heating, if it is to be generally accepted in northern climates.

(d) *General:* The opportunities for the use of machine computer technology in engineering work, as well as other areas, would seem to be a fertile field for profitable investigation.

Acceptable basic principles for engineering economic analysis would be very helpful.

These are only some of the things which need attention, but they are indicative. Some are already being given considerable study. There are many more possibilities, including those in non-engineering fields such as rate making, personnel practices, public relations, organization, management methods.

Implementation of Program

In answer to the question, "What should the utilities do in attacking these problems?" it seems quite obvious that they should do at least as much as they have been doing in the past and that somewhat greater general activity on their part is warranted and highly desirable. It is impossible to define the preferable scope of their undertakings, either as individual companies or as groups, in comparison with the scope of the manufacturers and of other agencies, but some indications might be mentioned.

The manufacturers may quite properly be expected to lean quite strongly to those projects which give promise of producing products which are saleable at a good profit. This should not be understood as a criticism. Quite the contrary, the manufacturers have, in general, done and are doing a surprising amount of long range thinking and basic investigation for which the returns, if any, are certainly intangible. The utilities will continue to have a large part here in cooperation with them, to stimulate improvements, to work them out in the field, and to criticize constructively. This they will do individually and through their organizations and committees. In doing so they should clearly recognize the commercial necessities of the manufacturer to sell the product and to make a profit, and should give their assistance in this direction, as well as in the technical aspects.

The special scope of the utility industry as a whole would otherwise seem to lie best with those projects which—

1. Are of particular benefit to the utilities themselves. Operating problems constitute one example.

2. Are of such a nature as to be outside the probable interest of manufacturers or other agencies, at least in the early stages. Some of these can be turned over to manufacturers if and when they reach the stage of profitable possibilities.

3. Are not likely to get done unless the utilities do them, at least not as soon as they are needed, and

4. Give promise of producing tangible worthwhile results in better service or greater economies.

Greater interest by the utilities in the more nebulous, long-range investigations in "pure science," without immediate objectives, has been suggested. Such work is of importance for the future of the industry and should not be ignored. It must be remembered, however, that the utilities are subject to regulation. Expenditures for tangible objectives of better service or economy are clearly justifiable, but undue emphasis on remote possibilities must be approached with caution. For this reason it is believed that, for the present at least, the chief objectives for the utilities must be found among those many possibilities which can be somewhat clearly defined.

Separate Industry Laboratory

Similarly, the proposal which has been made for a separate industry laboratory is a questionable one, at least for the present. There are a great many existing laboratories in the country in colleges and in independent organizations, which are capable, willing, and anxious to undertake research projects for the utilities. Let us use these to the fullest advantage before considering the establishment of a new one. The many millions of dollars necessary for the latter could be justified only

by a very real and specific need for it.

The engagement of college laboratories for utility projects can have an important auxiliary benefit. There is no question that research work in such laboratories tends to stimulate interest in the subject among the students. Greater student interest in the electrical power field is badly needed, if we are to have sufficient well-trained graduates to carry on our ever increasing work. Money so spent, either by individual companies or by groups or national organizations, could pay dividends in this respect alone.

Increased Sponsorship

Increased sponsorship of suitable research projects by individual companies, either within their own organization or by outside agencies, particularly colleges, should be encouraged. Here again it is difficult to specify which projects can best be handled in this manner and which should be approached collectively. In general, the individual company can undertake those things which are of the lower order of cost, are of more immediate need, especially to that company in its operations, and for which adequate facilities are available within the company or near at hand. It is to be expected that many such projects will benefit other companies and the industry as a whole, as well as the sponsor. In general, individual sponsorship is preferable to group sponsorship when feasible. For the broader scale projects, however, cooperative action through associations or societies is required.

Need for Central Organization

There is a very real present need for a central organization which will—

1. Correlate and coordinate the large amount of research work which is done by the individual utilities,

2. Stimulate and direct new projects which appear desirable for group action, and

3. Publicize the activities and the results being accomplished in both areas.

This would effect reduction of duplication of effort and the accompanying waste of funds, and would increase the awareness of the value of research both within and without the industry.

It would seem that these objectives could best be accomplished by an organization already established and working in this field. The EEI has such an organization. Its Research Projects Committee has been active in studying and screening projects proposed by various other EEI committees and also those for which support has been requested by outside agencies, recommending the ones which appear to be suitable to the Board of Directors for its decision. This activity has been increasing during the three or four years of the existence of this committee and could well lead to the establishment of a full time staff for the purpose, under the general direction of a volunteer committee. This has already been suggested as a possibility by others. Such a staff could well carry out the functions of correlation, initiation, follow-up, and publicity for a much expanded program of research. This would seem warranted for the future health of the industry. Its accomplishment depends upon the interest and support of the individual utility members.

Summary

Summarizing, it is believed that the utility industry can well be proud of its record in research, as evidenced by the results accomplished in growth, service, and economy. There is much to be done in the future. Utilities acting individually and as groups could profitably take an increasing and a more definitely organized part in research. The research organization within the EEI is already set up to do this, if it can be expanded and strengthened along the lines which have been planned and which it has been following.

Electric Facilities Tested in Atomic Blast

(*Continued from page* 166)

wave and the thunderous roar of the explosion caught them unawares. A tremendous dust-cloud obscured the firing area, so that it was impossible to see from the observer area how "Survival City" had fared until several hours after.

The initial survey by the first team of EEI representatives made less than three hours after the shot, was followed three hours later by a group of seven who went into the area and spent the day assessing the damage. From the radiation hazard viewpoint, the test area was found to be safe enough to allow maintenance and repair crews to enter the area three hours after the explosion and remain for a full day's work.

The device, with a force equivalent to 30 to 35 kilotons of TNT, had done nothing observable to the electrical system at 10,500 feet, beyond the denting of a door on a relay and meter cubicle.

At 4,700 feet, where the typical homes were practically reduced to rubble, the damage to electrical equipment was termed "moderate." One suspension-type transmission tower had collapsed; and the distribution wood pole line would have required considerable rebuilding, with four of the 15 poles broken. Several distribution transformers had fallen and secondary and service drops were down. But this damage was of the type that could be repaired in a reasonably short time with materials normally carried in stock by electric utility companies.

The substation had survived the blast with only minor damage to essential components. The metal cubicle housing the meters and relays was heavily damaged and would require complete rebuilding, but the cubicle and its contents are not considered essential to emergency operation. The 4-kv regulators had been shifted on the concrete pad, causing a separation of electrical connections to the bus. But the substation was in sufficiently sound condition to permit re-energizing on a non-automatic basis.

It was also noted that the paint on the 69/11-kv transformers was blistered by the heat; that all ornamental-type street light standards were undamaged, though the luminaires had been blown to the ground; and that the modern pole mast-arm units were undamaged except for a moderate bending in the mast-arm itself. The stream-lined elliptical globes were all intact.

After the shot, all electrical equipment was tested, and results indicated that the system was capable of operating at its normal rated voltage.

So You Want to Mechanize Materials and Supplies!

Developed by a Project Committee
of the EEI-AGA General Accounting Committee*

WHEN utility companies were smaller, most of the record keeping and other paper work was done either manually or with the aid of such office equipment as typewriters, adding machines, and calculators. As they grew a little bigger, more advanced equipment was needed, such as bookkeeping machines, which semi-mechanized the office operations. As they continue to grow, and as their paper work increases, it becomes apparent that mechanization of all routine accounting procedures is desirable.

Semi-mechanized office operations may be defined, for these considerations, as the use of key-operated bookkeeping machines which require constant operator attention and manipulation and which have only semi-automatic printing, calculating, and totaling features. Complete mechanization, on the other hand, may be considered as equipment which requires very little operator attention and which will produce finished reports and records and which utilizes, for the most part, completely automatic features.

When a company approaches the point where it is profitable to mechanize all or some of its accounting routines, it becomes evident that mechanization results in advantages other than economic ones. These include better records, increased accuracy, and availability of more detailed reports.

At the 1954-55 Organization Meeting of the AGA-EEI General Accounting Committee held in Cleveland, Ohio, in September, 1954, it was noted that approximately one-half of the companies represented at the meeting had not mechanized their materials and supplies accounting. Accordingly, a Project Committee was formed to prepare a paper on the subject of Mechanized Materials and Supplies, which it was felt would be of interest to all companies and particularly to those who have not as yet mechanized their material accounting.

What Equipment To Use?

With respect to type of equipment, it goes without saying that volume is the determining factor in this regard. As a general rule, mechanization of Materials and Supplies in utility companies either accompanies or follows mechanization of other volume paper work, such as customer billing and payroll.

The various key-operated bookkeeping machines will be eliminated from any further discussion, since they are usually limited to record keeping and by-product reports are not generally available.

On the other hand, the various electronic data processing machines are too new to fully evaluate. It is felt that for the present and the immediate future, their cost may be relatively high and possibly beyond the limits of all except the larger companies.

Between the two types of equipment previously mentioned is punched-card equipment. For the past two decades this equipment has been the most widely adopted method of completely mechanizing accounting routines. This paper will therefore be predicated upon punched-card mechanization, but with the thought that most of the comments will still be applicable to mechanization of Materials and Supplies in the event other types of equipment are used.

Discussion of the particular make of punched-card equipment to be used is outside the scope of this paper and will not be mentioned, except to say that each make has its own merits which should be investigated by each company, especially if punched-card equipment is not presently used in any phase of the company's accounting operations.

Mechanization of Materials and Supplies, as presented herein, is presumed to be the conversion of some manual or semi-mechanized method to a complete punched-card machine accounting system. To realize the full potential of the mechanized method. it is necessary to "throw off the old and put on the new." Therefore, it is felt that mechanization should cover both quantities and dollars, and should integrate the requirements of the Operating, Purchasing, Stores, and Accounting Departments.

This contemplates, for example, that the activity or transaction card, which is punched to represent an issue from stock, will not only serve to reduce the quantity in the balance card but will also act to credit the current asset account for Materials and Supplies. It will charge work in progress, operation, maintenance, or some other account with the related dollars as well as the stores overhead amount. By-product records and reports become almost unlimited when the extent of mechanization is broadened.

Changeover—What Is Involved?

After the decision is made to convert to a mechanized Materials and Supplies procedure, the question arises, "How and where do we start?" In order to make the transition smoothly, complete approval and cooperation of top management, operating and accounting officials should be obtained prior to starting the program. A thorough survey of the present situation, including joint meetings with Operating, Purchasing, Stores, Accounting, and other interested departments, should be undertaken to cover such points as the following:

1. To establish areas of common interest in the changeover program, discuss objectives and assign responsibilities.

2. To determine the various kinds of Materials and Supplies prior to design of the coding pattern, and

* Project Committee Members: AGA—R. J. Farley, Chairman, G. C. Hamner, and J. H. Rees; EEI—C. A. Goranson, Chairman, J. A. Knott, and C. M. Monson.

3. To analyze all Materials and Supplies source documents, including the flow of these documents from the point of origin through the warehouse and accounting office routines.

There are, of course, many other items to be considered, but the essentials outlined above are fundamental and may be likened to the foundation on which a house is built.

Selecting the Coding Pattern

Following this "spade work," the next step is to select a coding pattern to cover the current Materials and Supplies as well as provide for future expansion. During the coding process, it will be evident that there exists a large assortment of very similar, but not identical, items of material. Many of these variations may have been brought about by changing operating conditions—such as higher pressures for gas and higher voltage for electric companies—or may exist because purchases are made from different manufacturers in different sections of the operating territory.

The coding of Materials and Supplies will encompass three very closely related items—a numeric code system, a uniform abbreviated description procedure, and a standard unit of measure for each item.

What is a numeric code system? In most instances, it is a six or seven digit number assigned to a particular stock item. This number is usually made up of the following components:

(1) Major Class designation, which is usually the first two digits of the code number.

(2) Minor Class designation, which is usually the two digits following major class. A minor class is not always required in a coding pattern depending upon the extent of materials and supplies carried in inventory.

(3) Item designation, which is the remainder of the number and will consist of three, four, or five digits depending upon whether or not minor class designations are used.

Major classes are established in order to group items of a similar nature. Examples in a gas utility company might consist of pipe, casing and tubing, various kinds of valves (check, gate, plug), flanges, and pipe fittings, while in an electric utility company we might find poles, crossarms, wire, and cable. In some instances, more than one major class is assigned to similar items for a particular reason, such as designating pipe between new and used. Minor classes, if used, are provided for dividing the major groups of similar items into smaller more closely associated items, such as separating pipe between plain-end and screw. Item designation generally provides for size, kind, weight, manufacturer, and similar data. The number of such groupings to be established, and the existence of both major and minor classes, depends on the engineering, operating, and accounting requirements of the individual company. In certain cases, due to the relatively small number of items involved, it is expedient to group more than one type of material in a class such as chemicals, compounds, paints, and petroleum products.

Why is a uniform abbreviated description procedure important? Lengthy descriptions are not readily handled by machines, and thus brevity, clarity, and uniformity are essential. The number of fields in a tabulating card is limited, and generally only about 20 card columns are alloted for description. This means that considerable thought must be given to condensing each description in such a manner that even though it is brief, it is still adequate to describe the item. Uniformity of abbreviations is important to facilitate working with the items and to make the reports more presentable and easier to read. A glossary of uniform abbreviations should be prepared and distributed for the review and approval of all interested departments. As a word of caution, although standard abbreviated descriptions are an integral part of the mechanized procedure, their importance can be overemphasized. There is little to be gained in continually rewriting these descriptions after the changeover to mechanization has been completed, since the proper use of the stock symbol or code number—if strictly adhered to—will insure accuracy of reference at all times.

Why is a standard unit of measure required? This is obviously important under any method of accounting for Materials and Supplies. It is especially true under a mechanized procedure. If a standard unit of measure is not utilized, confusion will result in requisitioning, purchasing, and accounting for certain items. In the event any item of Material and Supplies is handled in more than one unit of measure, such as paint (i. e.: pints, quarts, and gallons), the standard unit of measure should be the smallest unit carried in stock. If it is felt that conversion to the smallest unit will create errors and confusion, then a different material code number should be assigned, and each unit considered as a different item.

One of the more critical problems in stores accounting control is in the application of "units of measure," particularly to items being issued. A good share of inventory variances is caused through laxity in this phase of storekeeping. The problem should be recognized and emphasized during the changeover to mechanization.

With regard to establishing the original coding pattern, which incidentally is a "tailor made" job for each company, it has been the experience of some companies that the best method of gathering the required information for item description, size, specifications, etc., is on a card record. The size of the card form should be sufficient to accommodate all necessary data and at the same time provide flexibility in handling, sorting, and coding. Space should be provided on this card record to insert additional information and make corrections, for as the job progresses these are almost sure to occur.

A Central Stores Department, Stock Control Department, or whatever name it may be known by, should coordinate the mechanized procedure acting in a liaison capacity between the storerooms and the machine and accounting sections. This department should be responsible for the preparation of the Materials and Supplies Code Manual as well as its revision and perpetuation, thereby controlling the assignment of new stock code numbers, abbreviated descriptions, and units of measure. It should also be responsible for clearing the source documents between the storerooms and the accounting and machine sections, as well as for the forwarding of completed machine prepared reports in the other direction. In most instances the nucleus of this department is already existent within a company.

Stores Locations

Generally speaking, there are two types or kinds of companies insofar as storing materials and supplies is concerned. The one is the metropolitan

company serving one large city and its surrounding surburban population in a concentrated area, while the other is the widespread company serving many small cities and communities over an extensive area sometimes covering more than one state. Storerooms or stock locations of the former type of company are generally large attended warehouses and are few in number, whereas the latter type of company has many different stock locations—some attended, others unattended—spread over the operating territory.

Common Solutions

Mechanization of Materials and Supplies has its individual problems for each of the above mentioned companies. However, certain solutions are common to both.

For convenience of processing paper work under a mechanized plan, each stores location should be assigned a location code number. The first part of the location number generally serves to identify the district or division, while the remainder of the number identifies the storeroom. An advantage sometimes gained during the survey of stores locations, in anticipation of mechanizing Materials and Supplies, comes about through a consolidation of certain storerooms, which consolidation may not have otherwise taken place.

In some instances it is well to establish "imprest locations" at which point materials and supplies of a minor nature will be physically stored but included in the inventory of a recognized stores location. This will eliminate considerable paper work ordinarily required to transfer such items between locations.

Consideration should also be given at the stores locations to such problems as the most appropriate manner of storing items of material; methods of identifying material, such as bin tags and stencils; records to be maintained, such as possibly quantitative record of a few fast moving items; and methods of reporting various types of transactions. In all instances "good housekeeping" should be the first order of business which includes disposal of junk, cleaning warehouses, and, probably most important of all, the establishment of bin tags and other identifying media prior to the accounting mechanization.

Punched-Card Procedure

The establishment of the Materials and Supplies punched-card procedure will be greatly influenced by the type of equipment to be used, each type having its own particular advantages and limitations. One card form, or separate card forms, must be developed and designed to accommodate each type of card utilized in the mechanized procedure, such as activity or transaction card, covering purchases, issues, transfers, returns, and such; storeroom balance card; and company balance card In like manner the various report forms must be developed and designed, such as activity or transaction report, inventory investment report, storeroom quantity balance report, account distribution report, and periodic inventory report.

A one or two digit transaction or activity code must be established, the extent of the code and number of transactions depending upon the requirements of the individual company. Typical transactions are purchases, issues, returns, transfers, and adjustments. The manner of establishing and maintaining controls must also be determined.

The punched-card procedure should be flow-charted covering in exact detail each phase of the mechanized operation and showing such procedures as the manner of balancing to controls and the sequence of report preparation. From an analysis of this detailed flow chart, equipment and personnel requirements may be determined.

The source documents must be redesigned or revised to accommodate stock code number and other requirements. Consideration should also be given to scheduling and sequencing source documents in a manner which will expedite card punching and other tabulating operations. Some companies have found the Materials and Supplies source documents to be an excellent mark-sense application.

Accounting

Scheduling of source documents and closing dates in both the accounting and machine sections must be established. These two sections must operate with clock-like precision if all schedules are to be met.

The method of pricing material issues must be established, along with a manner of controlling the price. Of the various methods of pricing—that is: last-in first-out, first-in first-out, and average price—most companies have found the average price method to be the most practical. In some instances average prices are maintained by districts and divisions, but in most cases the average price is a company-wide price. Computation of the average unit price for each stock code number is readily obtained on punched-cards and is generally developed in the company balance cards, which contain both the quantity on hand and dollar value for each stock code number. The average unit price used for disbursements may be as of the close of the previous month, or it may be the current month's average, the latter being the inventory on hand at the beginning of the period adjusted by the receipts for the current month. The former method permits pricing and processing disbursement activity throughout the entire month, whereas the latter requires all pricing to be performed after the last receipt for the month has been recorded.

Price Variation Control

Whenever average unit prices are determined mechanically, some control should be exercised over the variations in the prices from month to month. A mechanical process of checking unit price variations each month against certain tolerable limits can be established which results in locating variations in excess of the tolerance. In many companies the tolerable price variation is set as ten per cent The mechanical check sets out those average unit prices each month in excess of the tolerable limits for investigation and correction if necessary.

By showing the account classification on the Materials and Supplies source documents and punching such classification into the activity or transaction cards, the account distribution for materials and supplies may be produced from the cards as a by-product. Total offsetting debit and credit cards for each transaction or activity code must be punched to zero-balance the material account distribution. It is the general practice to exclude purchases from the latter, since these are generally included in the accounts payable distribution.

The manner of applying stores overhead to material issues will, of course, depend upon the type of equipment used. It has been found possible on the various electric and electronic calculating punches to compute and punch both the base amount and the stores

overhead amount when extending the Materials and Supplies disbursement cards and check these calculations in the same run through the machine.

Inventory

Taking inventory under a mechanized materials and supplies procedure assumes a somewhat different aspect than under a manual procedure. In the first place, the inventory listings may be mechanically prepared so that the insertion of the actual count becomes the only manual operation. The determination of overages and shortages, and the pricing and recording of these differences, may all be accomplished mechanically through the use of punched cards. Certain companies have found inventory taking to be an ideal mark-sense application.

Monthly reports, being prepared mechanically, afford an excellent opportunity for stores personnel to spot check various items of inventory on a cycle basis. Differences may be reconciled with the monthly transaction or activity report. Large inventory overages and shortages generally can be eliminated if an adequate spot check program is carried on throughout the year.

Making The Changeover—How Is It Accomplished?

As previously mentioned, a centralized department, known as the Stores Department, Stock Control Department, Material Control Department or by some other name, should be established to coordinate the various aspects of the mechanized materials and supplies procedure. In some instances these functions may be placed in an existing department. This department should establish controls, maintain the code manual on a current basis, reconcile monthly Materials and Supplies investment reports with the ledger account, render advisory service to storeroom personnel, and supervise and reconcile inventories. During the changeover period, this centralized department will advise and assist in the work involved.

The time required for the changeover is naturally related to the number of stores locations involved, extent of coding required, capacity to absorb additional work in the machine section, and other related matters. Assuming that the company is widespread and has many stores locations, the changeover is best made on a cycle basis covering a period of several months. The first stores location to be converted to the mechanized procedure should be a "guinea pig operation" during which time manual methods are continued while mechanization is adopted. Naturally, this paralleling of Materials and Supplies manual vs. machine procedures should cover only a small volume of the over-all paperwork and should continue for not more than one or two months. It should be a representative pattern, however, of the entire material and supplies activity and should bring to light the rough places in the mechanized procedure which need improvement and which may then be corrected prior to converting the entire inventory. The "side by side" manual and mechanized procedures are by-passed by some companies, if past experience in other changeovers indicates that this precaution is unnecessary.

Following the "guinea pig operation," it is wise to hold meetings with interested departments relative to the salient features of the mechanized method. From such meetings, it may be determined if additional information should be incorporated in the reports, such as quantities on order, maximum and minimum quantities, surplus quantities, and month and year of last activity.

The changeover to the mechanized procedure should proceed for the entire company as rapidly as the personnel and equipment assigned to the project can carry on the work. As the changeover nears completion, attention should be given to any changes in schedules or procedures which may be required to accommodate the machine load. Following completion, an investigation should be made to determine if more widespread use of the Materials and Supplies reports appears feasible and to insure that any misunderstanding on the part of any department relative to the mechanized procedure is clarified.

Completion of the Changeover—What Is Gained?

Mechanization of the materials and supplies procedure brings numerous benefits to a company. Certain departments such as operating, purchasing, stores, and accounting, gain a new tool which is invaluable to them in carrying on their particular phase of the company's over-all operating pattern.

The operating departments benefit from the mechanization in that the Materials and Supplies for construction and maintenance programs can be more accurately planned, a material standardization program can be more easily followed, and surplus materials are known and become available, while obsolete materials become more evident.

The Purchasing and Stores Departments benefit by being advised of surplus materials which can be made available for inter-location transfers, by knowing exact quantities of materials which are on hand at each location, and by having a complete picture of the Materials and Supplies inventory at all times.

The Accounting Department gains by having more efficient, less costly record keeping, including many by-product records and reports; more simplified pricing methods; obsolete materials charged off currently; and by the fact that errors in pricing, extension, and record keeping are kept to a minimum.

Other Benefits

Many more benefits are achieved. For example, two such benefits would be easier inventory taking and an increased turnover of materials.

One final thought—any company considering conversion of their Materials and Supplies procedure to a mechanized method will find that those companies which have already traveled the road are most ready, willing, and able to offer suggestions, point out the obstacles that may exist, and lend a helping hand to the current traveler.

Executive Development

(*Continued from page* 170)

knowledge, (2) by adding to the skills, (3) by changing the habits, and (4) by influencing the attitudes of people."

The test of the value of an Executive Development Program then lies in the degree to which it achieves these ends with those members of the organization responsible for the present and future management of the business.

In our own case I am convinced that we have improved the attitudes and relationships of our supervisory personnel, that we have achieved increased productivity in our organization and are building a sound management team for the future.

Job Briefing in the Field

By R. F. Stone

Construction Training, Commonwealth Edison Company

An Address before a Meeting of the EEI Transmission and Distribution Committee, Detroit, Mich., May 3, 1955

OUR subject for this article is "Job Briefing in the Field." Perhaps some of you would refer to this subject as "The Tail Board Conference," and that's alright, because we're all talking about the same thing.

Last Fall, at Commonwealth Edison Co., we completed a training program on Job Briefing involving 350 men in charge of overhead, underground, and tree trimming crews in one area of our Construction Department. All of these men are now following a standard plan in briefing their jobs.

Probably the best way of telling you something about Job Briefing and how this training program was conducted would be to take you into a classroom and describe to you what goes on.

Obviously, it would be impossible to cover the entire course in our limited space, so I'll just hit the high spots which should give a general idea of the scope of the program and how it was put across.

The text material and visual aids were tailor-made to fit our particular needs and field conditions.

Job Briefing Defined

Before we go any further, let's consider for a moment what we really mean by Job Briefing. We feel that Job Briefing is one of our most important channels of communication. Through this channel, men-in-charge of crews engaged in field work can let their men know what they are expected to do, and also make sure that there is a common understanding of the job they are about to tackle.

Now, let's get into our training program. It was a 7½ hour course divided into three 2½ hour sessions.

This is the outline of the first session.

FIRST SESSION—2½ HOURS

1. Let's Get Acquainted, 15 minutes
2. Introduction to the Program, 15 minutes;
3. Advantages of Job Briefing, 30 minutes;
4. Techniques of Job Briefing, 30 minutes;
5. Demonstration, 30 minutes, and
6. Assignment and Explanation of Practice Problems for Session 2, 30 minutes.

1. *Let's Get Acquainted*

About 15 minutes is allocated for getting everyone acquainted. We use the card technique, and go around the table asking each man to tell a little about himself and his background.

2. *Introduction to the Program*

(Fig. 1) We start out by defining Job Briefing as a practical plan to help the man-in-charge in leading his crew to work more safely and efficiently. It includes such steps as:

a. Explaining the work to be done.
b. Discussing the hazards involved and the safety precautions to be observed.
c. Determining the work methods to be followed, and
d. Making work assignments.

3. *Advantages of Job Briefing*

At this point we introduce the question, "What can we gain through Job Briefing?" In answering this question, the instructor uses a flip chart and tells the class that experience has proved that when Job Briefing is thoroughly understood and properly conducted (and here the instructor opens the flip chart), we can expect:

a. A reduction in accidents.
b. It will be easier to direct jobs.
c. There will be greater interest in the job (both on the part of the individual and the group).
d. Men will acquire job knowledge more quickly.
e. It will aid in determining where additional training is necessary.
f. We may expect an improvement in crew performance.

All of these points are expanded and discussed so that the group will have an idea of what they can expect to gain from Job Briefing.

Fig. 1—Introducing the Program

4. *Discussion of Job Briefing Techniques*

Now we are ready to study the Job Briefing procedure step-by-step, and see how it is used.

A wallet-size card is given to each trainee to be used as a guide. It outlines the various steps to be taken in order to brief a job.

STEP I—Planning the Briefing.

a. Develop your own work plan.
b. Consider existing and potential hazards possibly involved.
c. Consider how work assignments will be made.

STEP II—Conducting the Briefing.

a. Show print to men.
b. Explain the What, Why, When, Where, How, and Who is to do it.
c. Discuss general plan of procedure.
d. Discuss existing or potential hazards and how to eliminate or protect against them.
e. Make work assignments.

STEP III—Briefing for special conditions.

a. Complex jobs—brief only a portion.
b. Changes in job conditions, brief on these, too.

STEP IV—Follow-up to be sure:

a. Plans are being followed.
b. Each man is carrying out his work assignment.

5. *Job Briefing Demonstration*

At this point, the instructor puts on a demonstration to show the trainees how the techniques of Job Briefing are applied. Using a set of color slides, the job is "brought into the classroom." The job used for this demonstration was an actual job—and not one staged for teaching purposes.

Two screens are used in the demonstration. The work print remains on one screen while a series of colored slides covering the various aspects of this particular job are shown on a second screen. In this way, the instructor simulates field conditions at the same time the group is studying the work print. Following the demonstration, a discussion is held on the techniques used, referring to the wallet card discussed previously.

6. *Assignment and Explanation of Briefing Problem for Session No. 2*

Each trainee is given a practice assignment book which contains all the necessary information on a job to be briefed. For example, the work order which tells what is to be done is shown in Fig. 2. Then there is a series of 8 x 10-in. black and white photos taken from several angles to show the man-in-charge what he would see on the job.

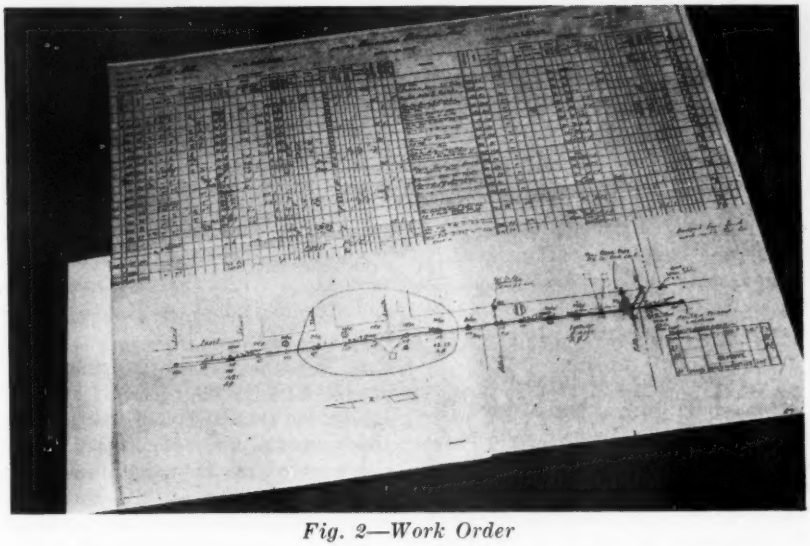

Fig. 2—Work Order

When the trainee briefs his job before the class, he uses a set of color-slides corresponding to the black and white photographs included in the "assignment books."

SECOND SESSION—2½ HOURS

1. Review Techniques for Job Briefing, 10 minutes;
2. Practice Session (each group member is given time to brief a job which is followed by a critique on his presentation), 120 minutes; and
3. Assignment and Explanation of Briefing problem for Session 3, 20 minutes.

THIRD SESSION—2½ HOURS

1. Review Advantages of Job Briefing, 20 minutes;
2. Practice Session for Each Group Member and Critique, 110 minutes; and
3. Review Booklet on "Job Briefing," 20 minutes.

Each trainee is given a booklet as a summary and reminder of the program, and as his diploma.

It includes all the steps involved in the Job Briefing Techniques and each step is illustrated to help make a more lasting impression.

There are a few additional points in connection with this program.

1. Each class was limited to five men.
2. The Division Operating Superintendent "kicked-off" the first session for each group. This brought top-management into the "act."
3. All levels of supervision in the area involved received the training. (This puts them in a better position concerning their responsibility to follow-up.)
4. Each trainee was assigned a different job in each practice session; thus a wide variety of work was covered—making it relatively easy to maintain a high level of interest.
5. The trainees were assigned overhead, underground, or tree trimming jobs depending on the nature of their work.
6. The visual aid equipment was handled by the instructors.
7. The instructors were training advisors who received specific training on this program before it was initiated.
8. To get uniformity in methods of presentation, instructors followed the same "Instructor's Guide."

In summarizing this experience, we have found that *telling and showing* people is just not enough. A *third* step is necessary in order to get complete and satisfactory results in this type of training—and that is *practice*.

It is in this practice situation that men get the real "feel" of handling this tool of supervision being given to them, and thus are able to develop more confidence in their ability to apply their learning on the job.

Transmission and Distribution Committee Meeting

By J. W. Anderson, *Chairman*

THE spring meeting of the Transmission and Distribution Committee was held on May 3 and 4 at the Hotel Statler in Detroit with 220 members and guests in attendance.

Former Chairman Honored

Howard P. Seelye, Manager of Engineering of The Detroit Edison Co. and former chairman of the Transmission and Distribution Committee, was honored at a luncheon where J. W. Anderson on behalf of the Committee presented him with a scroll expressing appreciation for his many years of distinguished service to the electric light and power industry.

Safety Group

The meeting opened with the Safety Group session, sponsored by W. M. Penney.

R. P. Douglas, Chairman of the Accident Prevention Committee, stressed the need for more emphasis on driver training programs to eliminate motor vehicle accidents as one of the leading causes of fatalities in the industry. R. D. Snowden then described an equipment operators training program recently inaugurated by The Detroit Edison Co., aimed at improving efficiency as well as safety.

R. F. Stone outlined training on job briefing in the field recently given to 350 men in charge of Commonwealth Edison Co. construction crews. The program consists of three 2½-hour sessions for groups of five men utilizing specially trained instructors, specially designed test material and visual aids, demonstration of proper technique, and two practice sessions with critiques for each individual trainee.

I. R. Dohr discussed various safety techniques found effective by the Consumers Power Co. Those particularly emphasized were ones which create personal interest through active participation in safety programs and recognition of safe performance. These include a comprehensive annual supervisors safety conference, interdivisional safety contests, and various group and individual safety awards.

Standards and Specifications Group

Subcommttee chairmen reported on various activities of the Standards and Specifications Group, sponsored by W. L. Vest.

F. E. Moesta reported that proposed EEI-NEMA street lighting equipment standards for steel luminaire supports, film cutouts, high voltage controllers, insulator head, and reflector interchangeability and a revision of existing standards for metal head and reflector interchangeability still await determination of some dimensional details before they are ready for ballot. Work on standards for multiple sockets, photosensitive devices, and dimensional features of series transformers and ballasts is continuing.

F. C. Marschner reported that proposed specifications for solder-sweated, split, tinned-copper connectors have been submitted for ballot. Work on proposed specifications for compression type copper connectors is progressing satisfactorily.

E. T. Coupal described plans for developing a guide for the selection, installation, operation, and maintenance of reclosers.

M. H. Powell announced publication of a revision of TD-5, *Specifications for Eyenuts and Eyelets.* The proposed revision of specifications for steel insulator pins soon will be released for printing. Balloting on the proposed revision of specifications for steel crossarm braces indicated that still further modifications and a reballot are required. A proposed revision of specifications for eye bolts is about ready for ballot. Good progress is being made on a proposed revision of specifications for strand-eye anchor rods and on proposed new specifications for insulated clevises and wireholders. Work on proposed new specifications for extension brackets for secondary racks, aerial cable hangers, and standard markings for corrosion resistant hardware also has been initiated.

F. A. Ashbaugh stated that proposed specifications for wood pins are about ready for ballot. Review of experience with TD-100, *Specifications for Full-Length, Non-Pressure Preservative Treatment of Poles,* suggests probable revision to retain only "extra" treatment as the single standard. Investigation of the suitability of electric moisture meters as a simple means to determine moisture content of southern pine crossarms is continuing.

Underground Group

The Underground Group, sponsored by H. E. Cody, covered a variety of subjects.

J. A. Pulsford reported good progress in revision of the NELA *Underground Systems Reference Book* now scheduled for completion sometime next year.

A report from C. P. Xenis outlined progress in development of a proposed guide for loading network protectors.

G. H. Fiedler described an unusual case of movement of four sections of cable in tile conduit 20 in. under a macadam road. Traffic has caused movement of as much as 37 in. in a 457-ft section in eight months. New heavier cable restrained in compression with cable grips attached to a copperweld holding wire has failed to eliminate trouble.

L. W. Clark reviewed extra high voltage transmission practice in Europe, noting almost universal acceptance of 380 kv for bulk power transmission. For example, the western European power pool now utilizing 220 kv for major ties will begin using 380 kv in a year or two. The predominant design feature is the wide use of two, three, or four bundled conductor construction even on some 220-kv lines.

L. I. Komives reported that a survey of companies in the United States and Canada indicates that many contemplate using transmission voltages above 300 kv and that this will be accompanied with a requirement for cables 230 kv and above within the next 15 years. Although there are a number of 230-kv cable installations in Europe and one new 300-kv installation in Canada, he expressed the need to initiate development and field test of cables in the 330-400 kv range suitable for use in this country.

Overhead Group

The Overhead Group, sponsored by M. H. Pratt, opened with several reports concerned with the use of aluminum.

R. N. Coe announced that the EEI Board of Directors has approved the proposed plan for the second phase of research on aluminum conductor fittings to be performed by the Armour Research Foundation with provision for financial participation by conductor and connector manufacturers.

Mr. Coe also reported plans to organize a task force to work with manufacturers of compression connectors for aluminum conductors in an attempt to develop standards for tools, dies, or fittings which will provide greater interchangeability of tools.

C. T. Nicholson described installation of 23 - kv aluminum - sheathed paper-insulated cable on a 6000-ft double circuit subtransmission lateral. The three 350 mcm compact sector copper conductors are contained in a 110 mil aluminum sheath with an outside diameter of 2.52 in. The cable is suspended in a horizontal position from a messenger by means of stainless steel straps at 8 to 10-ft intervals and a special mid-span clamp. Welded splicing sleeves are used to join the 1000-ft sections.

L. J. Jacobi outlined progress of the ASTM wood pole testing program established to more accurately determine the strengths of the five most commonly used species of poles.

M. S. Hudson described a new method for determining the amount of creosote remaining in poles in service which is designed for use by field personnel. Part of a boring near the ground line is ground to a powder, mixed with dimethylformamide which dissolves the creosote and then color matched with standard solutions.

C. C. Wiedemann described special construction required to carry a double circuit 115-kv transmission line through an urban area on railroad right-of-way for a distance of three miles. A narrow one-mile section of the right-of-way required the use of special portal type suspension and strain towers composed of two vertical latticed columns as much as 117 ft above the base connected together with two 70-ft horizontal latticed beams.

Establishment of a task force to study mutual assistance coordination between utilities was reported by D. F. Tulloch. Various phases of coordination are to be investigated including means to expand coordination on a broader geographic scale.

General Engineering Group

The General Engineering Group, sponsored by D. Burns, devoted a major portion of its session to discussion of higher secondary voltages. T. C. Duncan presented a preliminary report of the Subcommittee on Higher Secondary Voltages which considers that it is too early to make a firm recommendation for a single nominal voltage in the 400 to 500 v range. If future application will be limited to industrial and large commercial load, then a 265/460-v system seems advisable. However, if application is expected to ultimately extend to all classes of load, then a 254/440-v system seems preferable. Pending final decision the report indicates a belief it is desirable at this time that transformers for this voltage range have a sufficient tap range to provide for either system. Discussion by E. A. Rothfus, A. D. Caskey, W. R. Bullard, D. K. Blake, R. F. Lawrence and W. J. Witte indicated about evenly divided opinion regarding the relative merits of the two system voltages. Discussion will be continued at the next meeting.

W. A. Upham outlined the activities of the System Planning Subcommittee.

Reporting on utilization equipment matters, B. Brady noted that preliminary data on 1955 room air conditioners indicates an average power factor improvement of several per cent and that several models already meet the minimum values specified for 1956 production in the ARI-EEI-NEMA *Interim Report on Power Factor of Room Air Conditioners.*

A paper by J. C. Slothower and E. G. Albrecht described 12.5-kv joint-use protection tests conducted by Northern States Power Co. and Northwestern Bell Telephone Co. with particular emphasis on high capacity circuits having high fault currents. The tests showed that coordination could be achieved in the majority of cases by the usual power circuit protective devices in combination with an experimental heavy duty telephone protector made available for the tests. Such an improved protector has a time-current characteristic which will provide positive clearing either through lock out of the power circuit recloser or burning off of the telephone line wire.

J. E. Mulavey and F. B. Holst described the use of rectifiers to replace unnecessarily large motor generators still supplying an isolated and diminishing dc service area in Detroit. A 300-kv ignitron rectifier serves as the primary source of power but did not provide adequate voltage regulation until a specially designed electronic regulating device was added. Supplemental 20-kw selenium rectifiers tried at two outlying points in the area produced voltage regulation problems not yet solved.

Hydraulic Power Committee Meeting

By P. M. Hess, *Chairman*

MORE than a dozen papers of interest to electric utility company hydraulic engineers were presented at the April 25-26, 1955, meeting of the Hydraulic Power Committee. The two-day session, which convened at the Biltmore Hotel in Atlanta, Ga., was attended by 35 members and guests who discussed subjects concerning the design and operation of hydro-electric stations. Included on the agenda were also reports by the Committee's subcommittees that have been organized for the investigation of hydraulic problems of particular import to the industry. The discussions following several of the papers suggested the formation of other subcommittees because of the current interest in certain areas.

The first paper of the morning session of the first day was presented by B. O. McCoy of Chas. T. Main, Inc., who reported on the St. Lawrence International Hydro - Electric Development. This two - and - a - half million horsepower project is located in the International Rapids Section of the St. Lawrence River about 74 miles upstream from Montreal. The project develops about 92 ft of head in less than 50 miles and consists of Barnhart Island Power Plant, forming a concrete gravity dam 167-ft high and 3230-ft long across Barnhart Island North Channel; Long Sault Dam, a curved concrete gravity spillway dam 145-ft high and

2250-ft long across the Barnhart Island Main Channel and Iroquois Dam, a curved concrete gravity spillway dam 118-ft high and 2741-ft long about 30 miles upstream to control the level of Lake Ontario.

The report of the Artificial Precipitation Subcommittee included papers presented by L. B. Card and T. C. Stavert and a report submitted by P. H. Yelton. Mr. Card reported on progress in cloud seeding operations in the Upper South Platte River Basin of Colorado. Mr. Stavert discussed 12 cloud seeding projects in the California area and summarized the activities of the Advisory Committee on Weather Control during the past year. Mr. Yelton's paper reported on the activities of the National Advisory Committee on Weather Control, weather modification activities in foreign countries, and legislation in the United States affecting weather modification.

Cloud Power and Water Power

Because of the Committee's interest in weather modification, W. J. Hartnett, President of Weather Corp. of America, was invited to address the meeting. Mr. Hartnett spoke on the subject of "Turning Cloud Power Into Water Power." He reviewed the history of cloud seeding technology and the early work of Drs. Schaefer, Langmuir, and Vonnegut, and also described various types of cloud seeding equipment and their operation.

An interesting paper prepared by A. T. Larned was presented by M. G. Salzman on the subject of water hammer in circulating water systems of steam electric stations. In discussing the paper, Mr. Salzman pointed out that his organization feels that water hammer problems lie within the province of the hydraulic engineer. The report summarized tests by Ebasco Services on this subject as well as discussions on the problem by engineers of equipment manufacturers and utility companies. The paper pointed out that with the trend in steam electric station design to vertical circulating pumps, higher syphon heads, larger conduits, and higher water velocity, the possibility of water hammer is increased.

A paper of considerable interest on the non-destructive testing of the mechanical components of hydraulic generating units was presented by Mr. Stavert. He pointed out in the paper that serious failures in major generating equipment in recent years have demonstrated the need for field application of test procedures which would give warning of structural weakness before complete failure occurs. Mr. Stavert outlined the program that has been in effect in the Southern California Edison Co. during the past seven years to accomplish this purpose.

P. M. Lefever discussed structural problems and repairs at the Conowingo Hydro Electric Station in three papers entitled "Repairs to the Concrete Area of a Future Unit Section at Conowingo," "Deterioration and Repairs to the Intake Dividing Wall of the Future Unit Section at Conowingo" and "Effects of Structure Movement at Conowingo Station." Mr. Lefever's papers, which were illustrated with slides, were followed by a discussion from the floor on concrete repairs and dam movement.

B. J. Fletcher described an investigation by Aluminum Co. of America of stresses occurring under operating conditions in the steel tunnel lining of the Bear Creek development of Nantahala Power & Light Co. Mr. Fletcher, in his paper, pointed out that while no series of tests in a single tunnel can give a single answer to the distribution of load between steel tunnel runners and the surrounding rock, much useful information was obtained from this research program.

Several papers were prepared on the subject of trash racks and disposal equipment. A. L. Cooke of the Newport News Shipbuilding and Dry Dock Co. discussed mechanical rack rakes for hydro and steam plant intakes and described the different types of arrangements that are used to clean the debris from hydro and steam plant intakes. Mr. Cooke's paper described developments that have occurred as a result of field reports on rake operations and trash problems.

On this same subject, T. J. Corwin submitted a paper discussing the experience of Pacific Gas and Electric Co. with trash problems. Mr. Corwin's paper pointed out their experience with racks of different designs and the manner in which trash is handled.

A paper by Mr. Salzman described an intake channel spray nozzle trash boom that is installed at The Dayton Power and Light Co. This boom has been found to be satisfactory for diverting floating trash from the intakes so that it is carried off by the river current.

G. R. Strandberg and G. J. Vencill discussed the problems of allowable vibration in hydraulic turbines. Mr. Strandberg referred to the reports of Committee members on this subject and Mr. Vencill described how vibration was eliminated from a water turbine at Osage Station by grooving the trailing edges of the turbine blades.

Draft Tubes Report

The Subcommittee on Hydraulic Turbine and Draft Tube Settings advised that its report on this subject, a preliminary draft of which was presented to the Committee a year ago, had been supplemented with additional information received from Committee members. This report which was approved by the Committee for publication as a final Committee report, discusses the function of draft tubes, types of draft tubes, the influence of specific speed on the design of draft tubes, the influence of cavitation factor on design and operation, the economy of limiting draft tube dimensions, access doors and tailrace gates, recommended settings for regulating units, the depressing of tail water for synchronous condenser operation, and the pitting of runners. The report also includes tests and experience data from manufacturers and operating companies.

W. J. Rheingans of Allis Chalmers Manufacturing Co. presented a paper entitled "Hydraulic Turbines — Design Operation and Maintenance" and R. S. Quick of the Baldwin-Lima-Hamilton Co. spoke on the subject of hydro-electric activities in the Pacific Northwest.

During the afternoon of the first day a round table discussion was conducted on problems submitted by Committee members. The second day was devoted to an inspection trip of North Georgia plants of Georgia Power Co.

Electrical Equipment Committee Meeting

By C. L. Derrick, *Chairman*

THE Electrical Equipment Committee held its 66th meeting at the Rice Hotel in Houston, Texas, on May 16 and 17 with an attendance of approximately 90 members and guests.

The program of the meeting consisted of the presentation of papers, reports, and discussions under the sponsorships of D. W. Taylor, Chairman of the Subcommittee on System and Apparatus Troubles; R. M. Pennypacker, Chairman of the Subcommittee on Operation and Maintenance; A. V. DeBeech, Chairman of the Subcommittee on Foreign Practices; H. E. Deardorff, Chairman of the Subcommittee on System Engineering; and S. C. Townsend, Chairman of the Subcommittee on Apparatus and Design. In accordance with established procedure, the committee devoted most of the first day to a closed session for informal discussion of apparatus troubles and other appropriate subjects.

On Monday afternoon the Subcommittee on Operation and Maintenance presented a symposium on maintenance of circuit breakers. Discussion was limited to breakers operating at the lower voltages. J. M. McReynolds discussed in detail the practice followed by Houston Lighting & Power Co. in maintaining their 69-kv oil circuit breakers and H. J. Martin informed the Committee regarding the oil circuit breaker maintenance practices of New Orleans Public Service Inc. L. J. Gill reported that Pennsylvania Power & Light Co. has experienced very little trouble with maintaining air circuit breakers providing they are very carefully checked before being put into service initially; basically a two year maintenance schedule is followed. S. L. Miller described in some detail the practices followed by Union Electric Co. of Missouri in maintaining their 5- and 15-kv classes of air circuit breakers; this company has had 14 years' experience with these breakers and are well satisfied with the small amount of maintenance required. It was generally agreed that less man hours of maintenance per unit are required for air than for oil circuit breakers.

The program of the Subcommittee on Apparatus and Design was opened with a paper by F. J. Berger describing the design features of Philadelphia Electric Co.'s new Penn Substation. This station is being built on the site of the old Broad Street Railroad Station and will be a high voltage (66/13.2kv) indoor design suitable for high load density urban areas. An unusual feature of the building design is that provision has been incorporated to build an office building or garage over the substation. The station will have two conventional transformers and utilizes a new type of 66-kv indoor metal clad switchgear. The need for this type of substation is becoming apparent in many urban areas. Mr. Berger said in future stations of this design forced oil cooled transformers will be used.

The second presentation of the Subcommittee on Apparatus and Design consisted of a paper describing the new Martins Creek Power Plant of the Pennsylvania Power & Light Co., presented by S. C. Townsend. This station is unusual in that it was designed as a peaking station and is capable of quick starting. Martins Creek is the first outdoor generating station on the PP&L system and has proven highly satisfactory.

K. M. Smith of Commonwealth Edison Co. described the system planning activities practiced by his company in a paper presented as a part of the program of the Subcommittee on System Engineering. Attention was focused on the development and plans for the period from 1952 to 1958; corporate changes in this period included the completion of the gas business which had previously been conducted in some communities outside of Chicago. Because of the limitations of condensing water supply along the rivers in Chicago, and zoning restrictions along the lake front, it has been necessary to locate most of the new generating capacity outside the city. In regard to transmission development and planning, Mr. Smith said that an elaborate 138-kv transmission system is in operation, and some new additions are being made, but consideration is being given to installation of a 330-kv transmission system.

The second paper on the program of the System Engineering Division was presented by P. H. Jeynes of Public Service Electric and Gas Co. and carried the title "Economic Comparisons of Alternative Plans." Mr. Jeynes explained the theoretical and practical factors involved in making economic comparisons and estimating the financial effect of adopting alternative plans. He explained that even after the various alternate plans have been studied and evaluated as to actual funds expended, the plan having the minimum expenditure might not be adopted because of the importance of other related factors.

R. G. Meyerand, Chairman of the System Planning Subcommittee, presented a report on the meeting of his group held in Columbus, Ohio, on Feb. 16, 1955. He reported that the morning was spent in reviewing the work of the project groups on Economic Comparison of Alternative Plans, Load Forecasting Methods and Procedures, and System Planning Rules. The afternoon was spent discussing var supply and control problems. The results of these studies will be presented to the Electrical Equipment Committee for review when they are completed.

Since A. V. DeBeech was unable to be present, the Chairman presented the program of the Subcommittee on Foreign Practice. This presentation included a description of a new 200-mw turbo-alternator, the largest in Europe, to be installed at High Marnham on the River Trent, and a discussion of direct current testing of generator stator windings; these latter tests conducted in England showed indecisive results similar to those obtained in the United States.

R. M. Pennypacker described briefly some experiments conducted by Pennsylvania Power & Light Co. using dry powder for extinguishing transformer fires. These tests showed this system had possibilities for installations where a source of water was not available and a permanently installed fire extinguishing system was desired. Mr. Pennypacker stressed that the dry powder system of extinguishing transformer fires had not been developed to the extent that it could be considered as a replacement for permanently installed fog nozzles where a water supply was available.

Purchasing and Stores Committee Meeting

By J. Donald Hogg, *Chairman*

Before an enthusiastic and representative group of member company representatives, the EEI Purchasing and Stores Committee presented a well planned program of purchasing and stores subject matter at its annual meeting held on May 9-11 at The Dinkler-Tutwiler Hotel in Birmingham, Ala.

Following the opening remarks to the morning session on May 9 by Chairman J. Donald Hogg, The Cleveland Electric Illuminating Co., words of welcome to Birmingham were expressed by H. Neely Henry, Executive Vice President, Alabama Power Co., on behalf of the host company.

Repeating Requisitions

G. C. Meetze, South Carolina Electric & Gas Co., as chairman of his project committee, made the first subject presentation with a discussion of "Repeating Requisitions," which included a list of the various advantages of using repeating requisitions as stated by the companies included in the survey. The three advantages listed most frequently were that repeating requisitions provided uniform, accurate descriptions and specifications; a reduction in handling of paper work throughout the entire purchasing process; and a valuable, concise history of purchasing transactions listed on those requisitions. The survey also listed some disadvantages of repeating requisitions, the two most frequently indicated being that no authority is retained in the purchasing department and the possibility of the buyer's becoming lazy and not alert to developing new sources of supply. The survey indicated that from the length of time some companies have used repeating requisitions, they are pleased and feel that they are doing the proper job and that there are 14 companies who have gone to repeating requisitions since the 1947 study was made.

E. J. Martin, New Orleans Public Service Inc., followed with a presentation of his project committee's report on "Operations of Tool Rooms and Control of Tool Stocks." "Minimum Inventory" and "Minimum Investment" were two terms appearing many times in the listing of advantages of tool rooms. Other advantages included provision for better availability of tools, more efficient utilization of tools, and standardization of tools.

Also, facilities are provided for easy issue of additional tools and equipment in an emergency; better care of tools is insured as it provides a method of making systematic repairs and provides adequate storage facilities to protect tools against breakage, rust, and other damage; foremen are kept alert to prevent disappearance of tools, and it provides better accounting for expensive and complicated tools. An organization also is kept adequately advised on the needs of tools, on the types of tools available, and on the job needs for tools.

Three significant advantages are the improvisation, through vast experience, as to tools and equipment needed for a job; the pooling of tools and ideas induces research; and investigation of new tool findings and toolrooms psychologically induces in employees a sense of obligation to care for tools and put them away.

At the luncheon meeting held on Monday, May 9, L. M. Smith, president of Alabama Power Co., addressed the group with some pertinent and interesting remarks on "The Expanding South."

Price Analysis Basis

The Monday afternoon session was opened with a discussion by R. C. Wenz, Duquesne Light Co., on "Price Analysis for Basis of Awarding Business," in which he pointed out that as a check on the ideas of purchasing agents about getting competitive bids, they are asked to evaluate (a) distribution of business —spreading of buying, (b) quality, and (c) individual bidders research and development work. It was pointed out that price is of course of major importance in any purchase. Quality is a part of price and the question as to the individual company's ability to make a quality product controls the type of bidders. Straight escalation is an objectionable manner of submitting prices and if necessary, the formula type is most acceptable. Progress payments are popular with the buyers of any large equipment.

Streamlining Paper Work

"Streamlining Stores Paper Work" was the subject of the report presented by L. C. Alexander, The Cleveland Electric Illuminating Co., on behalf of his project committee which discussed the Work Simplification Programs in his company and a few examples of streamlined clerical operations in the stores elements of our industry. The latter included the punch card system of accounting for stores transactions, the conversion of stores accounting from posting and accounting machines to the electronic punch card machines, the adoption of a repeating requisition to relieve division storekeepers and control warehouse stock requisition clerk of an odious task, the adoption of the material adjustment form designed to be used for any type of material adjustment, and the materials control unit which is responsible for placing material into stock at line warehouses at the request of operating or engineering elements.

Materials & Supplies Personalities

The session on Tuesday morning, May 10, was opened by C. H. zurNieden, Philadelphia Electric Co., presenting his project committee's report on "Materials and Supplies Personalities" which stated that "since personnel is involved in all phases of a company's activities—past, present, and future—their behavior determines the quality and quantity of use and investment in material and supplies." All planners of the use of material, and all users of material must share in the functions of making the use of moneys invested and expended for material. These people create inventory, and by the degree by which they plan intelligently, they establish good, bad, and indifferent effects on the use of and investment in materials and supplies.

A project report on "Reports of Purchasing and Stores Departments

to Top Management" was presented by J. E. Steele, The United Illuminating Co., for his committee which indicated that the making of reports to top management gives those in purchasing and stores a wonderful opportunity to tell the story of their aspirations and achievements and to increase the value of their departments to their companies through reporting of information which they all have available. The problem of what subjects to report on must of course be answered in each company and will often depend on the extent and responsibility and authority of the particular Purchasing Department.

Regular Reports Predominant

It was indicated that 83 per cent of the purchasing members of the committee surveyed now make regular reports ranging anywhere from one to several periodic reports at different periods of time and to different levels of top management. However, of those that do not make periodic reports some accomplish similar results through weekly or monthly meetings or through informal memos to management. The subject matter most often referred to was "inventory" or "stores." The next most commonly mentioned category was that of dollar commitments, while the third most commonly mentioned report is the informal letter or memorandum on price changes, strikes, changes in schedule, department problems, etc. Another category mentioned was the annual report or review which in many companies is a summary of the most important portions of their weekly, monthly, or quarterly reports. Information as to the number of requisitions received, number of requisitions on hand, number of orders issued, number of invoices processed, and number of claims filed with special comments on expediting problems, new vendors, number of vendors in operating territory, etc., constituted another subject matter of such periodic reports. Still another subject which lends itself to such reporting is industry conditions, such as price trends or special price situations, material availability, and news items on major vendors. Other items mentioned were transportation, fuel, transformer meters, competitive bids on major equipment, and salvage.

J. F. Crist, vice president of The Southern Co. and president, Gulf Power Co., addressed the luncheon session on Tuesday, May 10, with an enlightening and thought-provoking explanation of "The Facts on Dixon-Yates."

In the afternoon session on Tuesday, H. T. Simpson, Boston Edison Co., gave his committee's project report on "Do's and Don't's of Acceptance, Inspection, and Testing of Materials and Supplies." This was based on a survey approach and indicated that the great majority of companies do not have a so-called inspection organization. Stores personnel compare new material with ordering specifications and using or engineering departments decide if features of material not covered by specifications will be detrimental to its particular use. In all of the companies the operating and engineering departments develop the ordering specifications; they also inspect this material upon receipt except in those few companies that have inspection organizations. In a majority of companies arrangements for electrical and mechanical tests are the responsibility of the using or engineering departments. The majority of the companies surveyed indicated that stores receiving personnel or the using department verify quantities and weights during inspection. In reference to the employment of outside professionals a good number of companies engage their services in most instances for testing fuels or boiler supplies.

G. H. Cole, Alabama Power Co., followed with his project committee's report on "Analysis of Cost of Transacting Business" in which the subject matter was logically broken down into three sections: (a) costs directly incurred by the utility, (b) amounts factored into prices by suppliers, and (c) steps to reduce any costs considered excessive. Costs of transacting business postwar are sharply up with contributing factors including increased selling expense during the decline in volume of utility placement of orders, increased transportation, increased warehousing expense, and increased middleman margins.

A progress report of the Subcommittee on Standard Packaging was presented to the meeting by the subcommittee chairman, H. E. Hodgson, Wisconsin Power and Light Co. The Tuesday afternoon session was concluded with a short business meeting during which it was announced by Chairman Hogg that the annual meeting of the committee next year will be held in Boston, Mass., on May 7-9, 1956.

On Wednesday, May 11, the members were invited by the host company, Alabama Power Co., to visit the soft coal mine and new electric plant of the company at Gorgas, Ala., and were accorded a most interesting and hospitable visitation. A dinner on Monday evening, May 9, highlighted the social activity of the annual meeting and the ladies attending were afforded an opportunity for a luncheon at "The Club."

Planned Lighting Aids

TO answer a need for new commercial and industrial lighting promotional materials which was disclosed by an industry-wide survey conducted last year, hard-hitting, attention-getting sales aids — designed to assist utility companies in increasing consumer lighting sales— have been prepared by the Commercial Lighting Committee and the General Power and Heating Committee of the Edison Electric Institute.

Called the new Commercial-Industrial Planned Lighting Program, the new materials include sales ideas, direct mail pieces, customer handout booklets, and a bibliography of lighting promotional pieces—all prepared to back up utility company sales personnel in their attempts to raise lighting standards.

The packet contains store, window, accent, and office lighting mailers, and a sales ideas booklet for commercial use. Plant, maintenance, protective and office lighting mailers, an industrial handout booklet, and an outline of successful industrial lighting campaigns are included for industrial use.

Materials of the Commercial-Industrial Planned Lighting Program may be purchased separately at reasonable prices. A price list of individual items is available from the Edison Electric Institute, 420 Lexington Avenue, New York 17, N. Y.

Personals

James E. Harsh, Chairman of the Board of The Empire District Electric Co., has retired after association with the company and its affiliates for more than 51 years. **D. C. McKee,** President and General Manager, has been elected Chairman and President of the company. **E. J. Drewelow,** Vice President and Assistant General manager, was elected to the Board of Directors, re-elected Vice President and was named General Manager to succeed Mr. McKee.

Mr. Harsh started in the electric industry in 1903 with the Denver Gas & Electric Co., where he worked for six years before joining Empire to organize the Commercial Sales Department and to become the company's first sales manager. In 1912 he was sent to Sedalia, Mo., where he organized the Sales Department for City Light & Traction Co. Two years later he went to Salina, Kan., as vice president and general manager of the Salina Light & Power Co., transferring to Lincoln, Nebr., in 1917 as vice president and general manager of the Lincoln Gas & Electric Co. In 1923 that company's property was sold and Mr. Harsh took over the operation of the Virginia Power Co. as vice president and general manager. He returned to Joplin, Mo., in 1925 to become vice president and general manager of Empire and its subsidiaries. He was elected president in 1940 and chairman of the board in 1948. Mr. Harsh will continue to serve on the board of directors.

Mr. McKee, a native of Webster City, Iowa, was graduated from Iowa State College in 1919 as an electrical engineer and immediately entered the Doherty Training School of Cities Service Co. in Denver, Colo. In 1920 he transferred to Empire in Joplin as a member of the Engineering Department, becoming manager of power sales in 1922. In 1935, the year following his election to the board of directors, he became vice president and assistant general manager. He was made general manager in 1944, and became president and general manager in 1948.

Mr. Drewelow became associated with Empire in 1927, after having worked for about three years with Denver Gas & Electric. Following service in various capacities in the plant he was made superintendent of the Riverton Generating Plant in 1945. In 1949 he became assistant general superintendent of operations and in 1951 was elected vice president in charge of operations. He was appointed assistant general manager of the company in 1954.

At the same time, announcement was made of the election of **Frank H. Shelton,** Assistant to the President and Treasurer, to the position of Vice President and Treasurer. Also, **R. L. Kiddoo** was named Secretary and Assistant to the President.

Carl J. Forsberg, President of Wisconsin Power and Light Co., has been elected President of the Wisconsin Utilities Association, succeeding **Harold P. Taylor,** President of Wisconsin Public Service Corp., who automatically has become Chairman of the Association's General Advisory Committee. **Dudley B. W. Brown,** President of the Milwaukee Gas Light Co., has been elected Association Vice President and **Harold P. Chamberlin,** Assistant Secretary and Assistant Secretary of Wisconsin Electric Power Co., has been re-elected Treasurer of the Association.

Mr. Forsberg, a 1926 graduate of the United States Naval Academy, entered the utility field in 1928 in Illinois as a power sales engineer. Six years later he joined his present company as industrial engineer at Beloit and rose through the ranks to assume the presidency of the company in 1954. During World War II he served with the Navy, leaving service as a commander to rejoin Wisconsin Power and Light in 1945 as district manager at Lake Geneva.

Henry B. Sargent, President of Arizona Public Service Co., has been elected Chairman of the Electric Companies Public Information Program, succeeding **Robert E. Ginna,** Executive Vice President of Rochester Gas and Electric Corp., who served for two years as PIP Chairman.

Mr. Sargent has been in the electric utility business since graduation from Tulane University, having first joined Mississippi Power & Light Co. He became president of Central Arizona Light and Power Co. in 1946. When that company merged with Arizona Edison Co. in 1952 to form Arizona Public Service, he became its executive head. Mr. Sargent is chairman of the Executive Committee of the Association for Applied Solar Energy, a member of the American Institute for Foreign Trade, and a director of the Pacific Coast Electric Association.

New members of PIP's Steering Committee, which forms policy for the public relations program, include **Floyd D. Campbell,** President, New England Gas and Electric Association; **R. Roy Dunn,** President, Potomac Electric Power Co.; and **Arthur S. Griswold,** Assistant to the President, The Detroit Edison Co.

Gustav F. Watters, Vice President of Niagara Mohawk Power Corp., has been elected Executive Vice President of the company. He joined Niagara Mohawk in 1935 in the Appliance Service Department at Buffalo, N. Y. He was stationed in Olean for four years, serving in all of the company's operating departments. He later returned to Buffalo and in 1940 was appointed assistant to the vice president of the Niagara Lockport and Ontario Power Co.

E. L. Palmer, Assistant to the President and Secretary of Pennsylvania Power & Light Co., has been appointed Vice President, Public Relations. **H. J. Flood,** Assistant Secretary, has been named to succeed Mr. Palmer as Secretary.

Mr. Palmer joined PP&L as the first member of the company's student training course in 1923 immediately after graduation as a mechanical engineer from Stevens Institute of Technology. He entered the Commercial Department in 1925 and after two years of assisting in various rate studies he became assistant to the general commercial manager. In 1940 he was made manager of the Rate and Contract Department and in 1946 was appointed

assistant to the operating manager. He became assistant to the president in 1948 and assumed the added duties of secretary in 1952.

Mr. Flood joined the company in 1946 and was then responsible for shareowner relations, having been engaged with a group of utilities and, prior to 1926, with two of the nation's larger banks in work of a similar nature. He moved into his former position in 1952.

At Iowa Power and Light Co., **L. E. Slade,** Secretary, and **John W. Hummer,** Manager of the Rate Department, have both been named Vice Presidents.

Mr. Slade is a 1938 electrical engineering graduate of Iowa State College. He received his master's degree in 1942. He is also a law graduate of Drake University. He has been associated with Iowa Power and Light since 1940.

Mr. Hummer received a master's degree in engineering from the State University of Iowa in 1925. He was employed by The United Light and Railways Service Co. from 1925 to 1949, when he was transferred to Iowa Power as manager of the Rate and Valuation Department.

Lawrence B. Cappa, Assistant to the Vice President at the Dixon area of the Public Service Co. Division of Commonwealth Edison Co., has been elected division Vice President, succeeding **R. E. Wahler** who has relinquished his duties for reasons of health.

Mr. Cappa became a Commonwealth Edison student engineer following graduation from the University of Wisconsin in 1929. He was later assigned to the Engineering Department in the Northern Division and from 1932 to 1936 was a member of the Customer Service Department. He worked for several years as a power sales engineer and in 1940 was appointed district superintendent at Park Ridge, where he remained for five years. In 1945 he was transferred to Joliet as division service manager and became assistant to the division vice president there in 1951. In 1952 he assumed his previous position.

Ralph E. Cargill, Operations and Engineering Manager, and **E. L. Robinson,** General Sales Manager, both of Gulf States Utilities Co., have been elected Vice Presidents of the company.

Mr. Cargill after graduation from Lowell Institute, worked with the Presumpscott Electric Co. in Maine from 1918 to 1920 and with General Electric Co. from 1920 to 1922. During the next three years he was employed by the New England Bell Telephone Co. and a power company in Portland, Me. He joined Gulf States in 1925 as an engineer, becoming distribution superintendent at Navasota in 1935. He went to Beaumont in the same capacity in the same year and became operating superintendent in 1942. He became op-

214 Communities Enter $10,000 Contest for Community Development in Pennsylvania

A TOTAL of 214 communities located in 55 of Pennsylvania's 67 counties have officially entered the $10,000 Community Development Contest being sponsored this year by the Pennsylvania State Chamber of Commerce and five co-sponsoring groups, one of which is the Pennsylvania Electric Association. The deadline for entries was March 31.

Of the entries received, 64 are from cities of 10,000 or more population; 83 from communities between 2,500 and 10,000; and 67 from communities up to 2,500 population.

The following awards will be made in each of the three population classes for outstanding progress on selected community development projects: first, $1,500; second, $1,000; third, $500; and fourth, $250. In addition, a bonus award of $250 will be given to one of the three first-prize winners, and two electric companies (West Penn Power Co. and Pennsylvania Power and Light Co.) will match any prizes won by communities in their districts.

Co-sponsors of the contest, in addition to the State Chamber and PEA, are: Bell Telephone Co. of Pennsylvania, Pennsylvania Farm Bureau Federation, Pennsylvania Gas Association; and Pennsylvania Motor Truck Association.

Objectives of the contest are defined by the State Chamber's Community Development Committee as follows:

1. To make the community a cleaner, more progressive, more prosperous Home Town.

2. To bring more business to the community and more farm prosperity to the section.

3. To attract new residents and to give young people a good reason for wanting to stay and invest their youth and energy in their home community:

   (a) by developing present small businesses and establishing new local businesses and industries.

   (b) by working with farmers and agricultural leaders to stimulate agricultural progress.

4. To stimulate leadership among the community's people.

5. To develop educational facilities.

6. To offer present and future citizens comfortable living conditions, such as clean, attractive squares and parks, well-lighted streets, health, sanitation and recreational facilities, and other factors that contribute to a high standard of living.

7. To attract more trade.

The contest will cover the period from Jan. 1, 1955, to Dec. 31, 1955. Scrapbooks showing the varied local promotions must be mailed not later than midnight March 1, 1956, to the Community Development Contest Committee. All phases of economic, civic, and social community life, including a rural and suburban development program that covers the trading area of the community, should be included in the promotional activities.

The winners of the several groups will be announced on or before June 1, 1956. Winners must agree to spend their prize awards on community improvements.

As an aid for contestants, the Pennsylvania State Chamber of Commerce prepared a manual entitled "Local Action for Community Development," which it made available to Pennsylvania communities without cost.

erations manager in 1946 and assumed the added duties of engineering manager in 1954.

Mr. Robinson a native of Texas, joined Gulf States Utilities in 1921, a short time after receiving his degree from Texas A & M College. He began as a student engineer, working later in the Meter and Railway Departments and from 1925 to 1926 as meter foreman at Port Arthur. In 1926 he transferred to the Power Sales Department, where he served in a number of sales positions until being named head of the department in 1935. Mr. Robinson became manager of industrial sales in 1942 and was appointed manager of the Beaumont Division in 1947. He assumed his previous position in 1954.

J. Mason Guillory, Director of Advertising for New Orleans Public Service Inc., has been elected Vice President. With New Orleans Public Service since 1931, he is a 1928 graduate of Tulane University with a degree in mechanical and electrical engineering. He worked in all phases of the company's commercial and industrial sales operations and was made manager of the Industrial and Commercial Sales Division in 1942. He assumed his previous position in 1952.

Mr. Guillory, who was chairman of the EEI Industrial Lighting Committee from 1949 to 1951 and has served as chairman of committees of the Southeastern Electric Exchange and the Southern Gas Association, is a past president of the New Orleans Section of the Illuminating Engineering Society. In 1952 he headed the Sales Executive Council of the Chamber of Commerce of the New Orleans area to further the Council's objective of advancement of the sales profession. He is currently a member of various New Orleans civic and professional organizations, including the Advertising Club, Public Relations Society of America, Better Business Bureau, and the Chamber of Commerce's Convention and Visitors Bureau.

Francis A. Keane, Assistant Comptroller of Public Service Electric and Gas Co., has been appointed Assistant to the President. Mr. Keane started with Public Service in 1923 and held various positions in both the Statistical and Comptroller's Departments before becoming assistant comptroller in 1945. Mr. Keane is a graduate of New York University with a B.S. degree in civil engineering and holds a master's degree in business administration from New York University Graduate School.

Miles Cary, Operating Manager of Virginia Electric and Power Co., has been elected Vice President in Charge of Operations and has been put in charge of all electric and gas operations throughout Vepco's system.

After graduation from Massachusetts Institute of Technology with a B.S. degree in mechanical engineering, Mr. Cary worked for two years with the Brooklyn Edison Co. in New York and with a contracting firm on subway construction. He joined Vepco in 1926 and after a short assignment in Norfolk, Va., was transferred to Richmond, Va., as efficiency engineer and plant engineer. He was appointed superintendent of system operation in 1932 and became manager of system operation in 1944. He was named to his previous position in September, 1954.

E. Perry Knapp. Assistant Treasurer and Assistant Secretary of Potomac Electric Power Co., has been elected Treasurer of the company. Mr. Knapp has been with Pepco for more than 33 years and was originally employed as a clerk in the Accounting Department. He was elevated to his previous position in 1954 after having served five years as assistant treasurer.

Charles A. Collier Farm Electrification Building Dedicated

SOME 600 people attended the dedication of the Charles A. Collier Farm Electrification Building at the Georgia 4-H Club Center at Rock Eagle Park in Putnam County, Ga., on May 23. The building, the construction of which was made possible by a gift of $25,000 by the Georgia Power Co., was formally presented to the State by Harllee Branch Jr., president of Georgia Power.

Robert O. Arnold, Chairman, Board of Regents, University System of Georgia, accepted the structure for the State. W. A. Sutton, associate director of the State Agricultural Extension Service, presided at the exercises.

Mr. Collier, for whom the building is named, is a director and former vice president of the power company. In his remarks at the ceremony, Mr. Collier reviewed the progress of Georgia since 1909 when he joined the company.

A pioneer in the company's farm electrification program, Mr. Collier was responsible for its cooperation with the 4-H Club and other farm groups. Hybrid corn, pasture, farm, and home electrification contests have been sponsored annually for many years under his direction. In 1944 he founded the Georgia Better Home Town programs, which has been a leading factor in the postwar development of the communities of Georgia. This program has brought nationwide recognition and acclaim to the State and to the Georgia Power Co.

The Charles A. Collier Farm Electrification Building was equipped through the cooperation of more than 50 electrical appliance manufacturers, distributors, and dealers. It is a T-shaped structure, 92 ft wide and 80 ft deep, and consists of three main demonstration and assembly rooms. One room is devoted to electrical applications for the farm, feed mills, plant hotbeds, grain conveyors, and other equipment. This room includes a complete farm shop. A second area is devoted to electrical kitchen appliances, including ranges, refrigerators, water heaters, dishwashers, freezers, and small appliances. The third contains laundry equipment, television and radio sets, and small appliances.

The power company will be responsible for keeping the equipment up-to-date through periodic replacements.

Present at the dedication ceremonies were representatives of the University of Georgia, Georgia Farm Bureau Federation, 4-H Club, REA cooperatives, and state and local government.

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(Terms Expiring 1956)

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(Terms expiring 1957)

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Customer Collections, A. H. MAYER..... Consolidated Edison Co. of New York, Inc., New York, N. Y.
Customer Relations, T. J. PETERSON.....The Detroit Edison Co., Detroit, Mich.
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Industrial Power and Heating Group, G. S. YOUNG.....Kansas City Power & Light Co., Kansas City, Mo.
Residential Group, H. H. BRENAN.....Pennsylvania Power & Light Co., Allentown, Pa.
Special Service Group, F. C. PESVEYC.....Public Service Electric and Gas Co., Newark, N. J.

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Tax Policy, R. P. BRIGGS.....Consumers Power Co., Jackson, Mich.
Technical Exchange for Overseas Visitors, HARVEY E. BUMGARDNER.....The Detroit Edison Co., Detroit, Mich.
Transportation, RANDOLPH WHITFIELD.....Georgia Power Co., Atlanta, Ga.